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Courses Catalog 1982-84

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Information contained herein is for informational purposes only and is subject to change without notice. Individual departments and units should be contacted for further information. Courses, faculty assignments, prerequisites, graduation or completion requirements, standards, tuition and fees, and programs may be changed from time to time. Courses are not necessarily offered each semester or each year. The University retains the exclusive right to judge academic proficiency and may decline to award any degree, certificate, or other evidence of successful completion of a program, curriculum, or course of instruction based thereupon. While some academic programs are designed for the purpose of qualifying students for registration, certification, or licensure in a profession, successful completion of any such program in no way assures registration, certification, or licensure by an agency not the University of Illinois.

University of Illinois administrative offices at the Urbana-Champaign campus are open daily from 8:00 a.m. to 12:00 noon and 1:00 to 5:00 p.m. Monday through Friday, but not Saturdays, Sundays, or all-campus holidays which are indicated in the University Calendar.

An information center, available to visitors to the campus, is located in the north entrance lobby of the Illini Union. The center is open from 8:00 a.m. to 8:00 p.m. daily, including Saturdays and Sundays when classes are in session.

Campus telephone: (217) 333-1000

The policy of the University of Illinois is to comply fully with applicable federal and state nondiscrimination and equal opportunity laws, orders, and regulations. The University of Illinois will not discriminate in its programs and activities against any person because of race, color, national origin, religion, age, sex, handicap, or status as a disabled veteran or veteran of the Vietnam era. This nondiscrimination policy applies to admissions, employment, and access to and treatment in University programs and activities.

Executive Vice-President Ronald W. Brady has been designated as the equal opportunity officer for the University of Illinois. For additional information on the equal opportunity and affirmative action policies of the University, please contact on the Urbana-Champaign campus: William A. Savage, assistant chancellor and director of affirmative action, 107 Coble Hall, 601 South Wright Street, Champaign, IL 61820 (217) 333-0574.

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Courses Catalog

The following list of courses is arranged in alphabetical order by department and in numerical order within the departments.

Courses numbered:

100-199 are intended primarily for freshmen and sophomores although they may also be taken by juniors and seniors. In certain instances they may be taken by graduate students to make up undergraduate deficiencies, but they may not be taken for graduate credit.

200-299 are intended for undergraduate students who satisfy the published prerequisite(s), if any. In certain instances they may be taken by graduate students to make up undergraduate deficiencies, but they may not be taken for graduate credit.

300-399 are intended primarily for juniors, seniors, professional, and graduate students who satisfy published prerequisite(s), if any. Only graduate students and certain seniors with Graduate College approval may receive graduate credit (expressed in units).

400-499 are available for professional and graduate students, and certain seniors with Graduate College approval to register for graduate credit (expressed in units).

An undergraduate must have 30 hours of credit to be classified as a sophomore, a minimum of 60 hours to be classified as a junior, and a minimum of 90 hours to be classified as a senior. A graduate student is a person who has been admitted to the Graduate College.

Following the title of each course is a brief description of the content, the credit given, and the requirements for admission to the course, if any. Additional information relating to the course content is available from the offering department. Special requirements for admission to certain courses are introduced by the word *prerequisite*. Courses listed in this catalog are subject to revision without advance notice. Courses are not necessarily offered each semester or each year. Individual departments or units should be contacted for information regarding regularity of course offerings.

Each department has available the undergraduate course number 199, Undergraduate Open Seminar. This is a special course for independent study, for experimentation, or for seminar on topics not treated by regularly scheduled courses. Requests for initiation of the

course and suggestions for areas of study may be made by students; the course may also be initiated by a faculty member. The seminar may be offered with approval of the faculty member involved and the department head. A student may accumulate an unlimited number of credit hours in 199 courses, but no more than 12 such hours listed on the student's transcript may be counted toward fulfilling graduation requirements, except in cases where a larger number of credit hours in 199 courses is an integral part of a formal, college-approved program of study (such as Individual Plans of Study or Unit One). Credit toward satisfying particular college or departmental requirements is contingent upon approval of the appropriate college or departmental committee.

Credit for undergraduate students is counted in semester hours. A semester hour represents the work of one classroom period for fifty minutes each week through one semester (two periods per week in an eight-week summer session), or the equivalent in laboratory or field work or approved independent study. In description of courses, "3 hours" means 3 hours of credit each semester or summer session.

Credit for graduate students taking courses numbered 300 and above usually is counted in units. One unit is considered the equivalent of 4 semester hours of credit.

Undergraduate students wishing to enroll in courses numbered 300 and above for graduate credit or in 400-level courses for undergraduate credit must obtain the advance approval of the Graduate College.

Each undergraduate student is expected to pursue a normal program of studies; the number of hours required varies with the college and the curriculum. More or less than a normal program may be permitted only by the dean of the student's college or the dean's representative. To be eligible for participation in specified undergraduate student activities, the student must carry 12 hours in a semester. Twelve credit hours and above (3 units and above) in a semester comprise a full program of study for tuition and fees assessment; in an eight-week summer session the number of hours is 6 semester hours and above (1½ units and above). For information about criteria determining eligibility for Dean's List recognition, interested students should contact their college offices.

The minimum program required for receipt of maximum educational benefit payments under the Veterans Readjustment Benefits Act of 1966 and for receipt of social security benefits as a dependent is 12 hours (or 3 units) in a semester and 6 hours (or 1½ units) in an eight-week summer session.

Detailed information relating to admission, costs, and graduation requirements is given in the *Undergraduate Programs* and *Graduate Programs* catalogs. (See back inside cover for additional sources of information.)

ACCOUNTANCY

Head of Department: Professor F. L. Neumann

Department Office: 360 Commerce Building (West), 1206 S. Sixth, Champaign

101. **Principles of Accounting, I.** Introduction to financial accounting; the communication of relevant information to external parties; includes development of accounting model, internal control, measurement processes, data classification and terminology, as well as interpretation and use of the resultant financial statements. Prerequisite: Sophomore standing. 3 hours. Credit is not given for both Accountancy 101 and 201.
105. **Principles of Accounting, II.** Introduction to managerial accounting: cost systems, budgeting, management reporting, information for decision making, quantitative techniques, and financial analysis. Prerequisite: Accountancy 101. 3 hours. Credit is not given for both Accountancy 105 and 201.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Fundamentals of Accounting.** A survey course in the principles of accounting for students registered in schools and colleges other than Commerce and Business Administration. Prerequisite: Junior standing. 3 hours. Credit is not given for both Accountancy 201 and 101 or 105.
208. **Intermediate Accounting, I.** Accounting concepts, principles, and theory with an emphasis on the special problems that arise in applying these concepts for external reporting purposes; emphasizes the use of accounting information as a basis for decisions by management, stockholders, creditors, and other users of financial statements and accounting reports. Prerequisite: Accountancy 105. 3 hours.
218. **Elementary and Intermediate Accounting.** An accelerated course designed for students with advanced standing and no prior preparation in accounting who desire to major in accountancy; fundamentals of proprietorship, partnership, and corporation accounting; consideration at the intermediate level of basic concepts of accounting theory; interpretation of financial statements and analysis of the principal accounts represented therein. Selected cost accounting topics. Prerequisite: Junior standing, a general University grade-point average of 3.5, or consent of head of department. 5 hours.
266. **Cost Accounting.** Use of costs for control and decision making, with emphasis on standard costs, relevant costs, direct costing, nonmanufacturing costs, and responsibility accounting; for students who have already studied the basic elements of job order, process costs, and budgeting. Prerequisite: Accountancy 105. 3 hours.
274. **Basic Federal Income Tax Accounting.** Basic discussion of history, theory, and broad outlines of federal income taxation for individuals, partnerships, and corporations, including the more important basic concepts involved in federal income taxation. Prerequisite: Accountancy 105 or 201. 3 hours.
294. **Senior Research.** A research and readings course for students majoring in accountancy. May be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Cumulative grade-point average of 4.0, honors in the junior year, or consent of instructor; senior standing. 2 to 4 hours.
295. **Senior Research.** A research and readings course for students majoring in accountancy. May be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Cumulative grade-point average of 4.0 or honors in the junior year; senior standing. 2 to 4 hours.
300. **Socio-Economic Management as Public Policy.** Same as Business Administration, Political Science, and Social Science 300. See Social Science 300.
325. **Accounting System Design.** Introduction to the fundamentals of accounting system design including the design and use of business papers, records, and reports; the functions of data processing equipment in accounting systems; and personnel problems in accounting system design. Prerequisite: Accountancy 266; Computer Science 105 or equivalent. 3 hours or 3/4 unit.

- 341. Public Sector Accounting.** Examines accounting, budgeting, auditing, and reporting principles and practices for municipalities and other nonprofit organizations, including federal government, public schools, universities, hospitals, charities, religious organizations, and others. Prerequisite: Accountancy 105, 201, or equivalent. 3 hours or 3/4 unit.
- 350. Introduction to International Accounting.** Explores similarities and differences of accounting principles and procedures between the United States and other countries with special emphasis on worldwide and regional standardization; emphasizes consolidation of foreign subsidiaries, performance evaluation of foreign operations, statement analysis, translation, solutions to inflation accounting, and taxation of multinationals. Prerequisite: Accountancy 208 and 266, or equivalent; or Business Administration 460. 3 hours or 3/4 unit.
- 351. Analysis of Financial Statements.** The interpretation, implications, and projection of accounting financial reports and statements; emphasizes the use of statistical methods, economic concepts, and trend analysis in developing accounting measures of risk, in projecting the future impact of developments, and in forecasting and controlling operations and organizational developments. Prerequisite: One course in statistics as specified by the college. 3 hours or 3/4 unit.
- 362. Business Budgets and Accounting Control.** Procedures used in the preparation of business budgets and the principles underlying these procedures. Prerequisite: Nine hours of accountancy, including Accountancy 266. 3 hours or 3/4 unit.
- 366. Managerial Accounting and Quantitative Techniques.** Application of quantitative and mathematical techniques to managerial accounting problems including empirical methods, network techniques, probabilistic methods, linear algebra, sensitivity analysis, and other methods. Prerequisite: Accountancy 266; Economics 172; Mathematics 125. 3 hours or 3/4 unit.
- 367. Managerial Accounting and Organizational Controls.** A study of managerial accounting and its functioning as an information subsystem, in relationship to the system of organization and the attainment of the goals of the enterprise; stresses the interactions of the components of the enterprise in response to information generated by the managerial accountant. Prerequisite: Accountancy 266; senior standing. 3 hours or 3/4 unit.
- 371. Auditing.** Nature of audit evidence; basic audit techniques; audit practices and procedures; professional ethics; and audit reports. Prerequisite: Accountancy 208, Economics 172, and Computer Science 105. 3 hours or 3/4 unit.
- 372. Advanced Auditing Concepts and Practice.** Emphasizes the concepts and practice of professional auditing, including the application of generally accepted auditing standards, review of internal control, audit reporting practices, professional ethics, S.E.C. practices, statistical sampling, auditing EDP systems, and management advisory services practice. Prerequisite: Accountancy 371. 3 hours or 3/4 unit.
- 373. Control and Audit of Accounting Systems.** Introduction to information systems, particularly in accounting, and their control and audit; discusses manual systems but emphasizes accounting information systems in a computer environment. Includes case studies and projects. Prerequisite: Accountancy 371 or consent of instructor; Computer Science 105 or equivalent. 3 hours or 3/4 unit.
- 374. Advanced Income Tax Problems.** Practical and theoretical training in the more common and important provisions of the federal income tax, advanced problems, and tax case research and preparation. Prerequisite: Senior standing; Accountancy 274. 3 hours or 3/4 unit.
- 375. Internal Auditing and Management Control.** Examines concepts, standards, and procedures of internal auditing and management control; discusses specific case studies and problems to develop student awareness of and skills in the nonfinancial types of auditing such as operational, compliance, and management auditing, especially as practiced by either a business or a not-for-profit organization's own auditors. Prerequisite: Accountancy 371. 2 hours or 1/2 unit.
- 376. Intermediate Accounting II.** Examines accounting concepts, principles and theory with an emphasis on the special problems that arise in applying these concepts of

financial accounting for external reporting purposes; continuation of Accountancy 208. Prerequisite: Accountancy 208 or equivalent. 3 hours or 3/4 unit.

375. **Internal Auditing and Management Control.** Examines concepts, standards, and procedures of internal auditing and management control; discusses specific case studies and problems to develop student awareness of and skills in the nonfinancial types of auditing such as operational, compliance, and management auditing, especially as practiced by either a business or a not-for-profit organization's own auditors. Prerequisite: Accountancy 371. 2 hours or 1/2 unit.
377. **Advanced Problems.** Consolidated statements; branch accounting; business combinations; foreign exchange; business reorganizations; and recent developments in theory and practice. Prerequisite: Accountancy 208. 2 hours or 1/2 unit.
378. **Advanced Theory and Practice.** Selected problems from CPA examinations; analysis and revision of statements, partnerships, corporations, quasi-reorganizations, mergers, and others; theory, auditing, and ethics. Prerequisite: Accountancy 274, 371, 376, and 377. 3 hours or 1 unit.
391. **Introduction to Management Information Systems.** Same as Business Administration 391. Introduction to the fundamentals of information systems technology, techniques, and capabilities, particularly with respect to the use of information systems in an administrative setting. Prerequisite: Computer Science 105 or equivalent, or consent of instructor. 3 hours, or 1/2 to 1 unit.
392. **Information Organization for Management Information Systems.** Same as Business Administration 392. See Business Administration 392.
393. **Management Information System Development.** Same as Business Administration 393. See Business Administration 393.
394. **Management Information and Control Systems.** Same as Business Administration 394. Integration of behavioral, quantitative, and system design concepts in relation to professional work in the management information systems area. Prerequisite: Accountancy/Business Administration 393 or consent of instructor. 3 hours, or 1/2 to 1 unit.
401. **Accounting Analysis, I.** Uses of accounting information; collection, processing, and communication of accounting information; measurement of assets, liabilities, equities, and income; and accounting system design. 1 unit.
402. **Accounting Analysis, II.** An in-depth study of accounting valuation processes and accounting income measurement; special reporting problems of multiple-entity organizations; and accounting for nonprofit organizations. Prerequisite: Accountancy 401 or equivalent. 1 unit.
403. **Managerial Accounting.** Introduction to management accounting as part of the firm's information system, in terms of modern cost accounting and budgetary systems for planning and controlling business operations. Prerequisite: Credit or registration in Accountancy 401 or equivalent. 1 unit.
404. **Auditing.** Introduction to conceptual and applied material in the specialized accounting area of auditing; emphasizes the audit process, reporting, and professional responsibilities. Prerequisite: Credit or concurrent registration in Accountancy 402, or equivalent. 1/2 unit.
405. **Federal Taxation.** Introduction to historical and conceptual as well as applied material in the accounting area of federal taxation; emphasizes the provisions of the tax law relevant to accounting measurement methods. Prerequisite: Accountancy 401. 1/2 unit.
441. **State and Federal Accounting Theory.** Advanced study in accounting and other fiscal procedures of the federal government; state, county, and municipal governments; and institutions. 1 unit.
450. **Multinational Enterprise Accounting.** Analysis of accounting for operations of multinational enterprises which are subject to a wide variety of regulatory, social, and environmental influences; emphasizes financial and managerial accounting systems and their functions as evaluative, control, and reporting tools; and examines social accounting, foreign taxation, and nonmonetary evaluation methods.

Prerequisite: Undergraduate degree in accountancy or equivalent; or Business Administration 460 and consent of instructor. 1 unit.

451. **Accounting Under Different Social Systems.** An analysis and comparison of accounting systems under different social systems with emphasis on the impact of regulatory and political structures on accounting; compares both macro and micro accounting systems for politically centralized and decentralized planning. Prerequisite: Undergraduate degree in accounting. 1 unit.
455. **Macroaccounting.** Same as Economics 425. An examination of the fundamental concepts underlying the attempts to measure the economic activities of macro units; similarities and contrasts of accounting problems, theoretical and practical, of the business enterprise and of national or regional units in relationship to existing systems of accounting measurement; macroaccounting statements and analyses; and usefulness of macroaccounting techniques and data in evaluating national and regional goals. Prerequisite: Intermediate macroeconomic theory or consent of instructor. 1 unit.
461. **Management Accounting Theory.** Analyzes the theoretical foundations of management accounting, such as production functions, empirical and theoretical cost functions, and behavioral aspects of managerial decision and accounting practice; integrates relevant parts of organization theory, communications theory, control theory, and systems theory into the foundations of the managerial accounting process. 1 unit.
462. **Management Accounting, I.** An examination of recent conceptual and analytical developments in the area of management accounting; includes a study of modern and relevant planning and control techniques and their underlying concepts as applied to the various functional areas within the firm. Prerequisite: An undergraduate course in management accounting. The student's background in statistics, economics, and mathematics should be equivalent to the undergraduate requirements of the University of Illinois College of Commerce and Business Administration in these areas. 1 unit.
463. **Management Accounting, II.** Development of the role and importance of accounting data in conjunction with modern quantitative methods in the process of industrial enterprise administration; attention focused on the use of existing accounting data in models and the demands on data accuracy and reliability as well as the necessity to develop additional data for the purpose of facilitating integrated planning, budgeting, and control processes. 1 unit.
466. **Cost Accounting Theory and Analysis.** A critical examination of recent developments in management accounting theory and research. Prerequisite: Accountancy 462; or both Accountancy 362 and 366. 1 unit.
468. **Industrial Cost Control.** Study of cost accounting with emphasis on the use of operating data by management for control purposes; methods of material pricing and labor costs including fringe benefits; indirect manufacturing costs, direct costing, and standard costs; estimated and statistical costs; distribution costs; contribution to overhead theory; depreciation and replacement of equipment; selection of plant; decision to make or buy; and relation between costs and pricing policy. Prerequisite: Business Administration 460 or equivalent. 1 unit.
469. **Controllership.** The controller in the business organization: property control responsibilities; internal check; internal audits; insurance; assistance to operating management through budgeting, break-even analysis, and profitability studies; relationship with groups outside of management such as investors and government agencies; and emphasis on the manner in which the figure function of controller is used to integrate the operations of the business enterprise. Prerequisite: Accountancy 468 or equivalent, or Business Administration 460 and consent of instructor. 1 unit.
472. **Auditing Standards and Techniques.** A critical analysis of the techniques used in auditing; interrelation of audit standards, procedures, principles, and techniques; internal control as related to audit techniques; and trends and developments in the accounting profession. 1 unit.

473. **The Theory of Accounting System Design.** Problems and procedures in connection with designing and installing accounting systems. 1 unit.
474. **Income Tax Development.** A theoretical and historical approach to the study of the development of federal income taxation, together with some research on tax cases and critical appraisal of the current law and proposals for its revision. 1 unit.
475. **Impact of Income Tax on Management Decisions.** Studies the impact of federal income tax law on management decisions; stresses awareness and recognition of the types of tax problems, so that the managers who are generalists will recognize situations where they will need to seek advice from specialists. Prerequisite: Business Administration 460 or consent of instructor. 1 unit.
476. **Corporate Income Taxation.** Analyzes the tax treatment, problems, planning techniques, and underlying governmental policies involving corporations and their shareholders; coverage includes formations, operations, distributions, liquidations, reorganizations, and affiliations. Prerequisite: Accountancy 374 or equivalent. 1 unit.
477. **Partnership Income Taxation.** Analyzes the tax treatment, problems, planning techniques, and underlying governmental policies involving partnerships and their partners, including Subchapter S corporations and their shareholders. Prerequisite: Accountancy 274 or equivalent. 1 unit.
479. **Selected Topics in Federal Taxation.** Seminar on federal tax topics of current interest and how they shape the tax system; topics include international taxation, problems of closely-held businesses, tax factors in organizing and selling a business, planning for capital gains, real estate taxation, tax shelter, and new developments. Prerequisite: Accountancy 374 or consent of instructor. 1 unit.
481. **Concepts and Principles.** The fundamental structure of accounting theory developed through the study of concepts characteristic of accounting and an examination of the literature dealing with the concise formulation of accounting principles. 1 unit.
483. **Income Measurements.** A study of the pros and cons of various unsettled issues involved in the calculation and disclosure of enterprise periodic income. 1 unit.
485. **Relationship of Accounting Theory to Philosophy, Science, and Other Disciplines.** An examination of the relationship of accounting theory to the developments, thoughts, and methods in the fundamental intellectual disciplines. 1 unit.
489. **History of Accounting Theory.** An examination of the more important aspects of accounting theory under the impact of changing conditions over four centuries, with major emphasis on the later developments. 1 unit.
491. **Accountancy Research Orientation.** Comparative study of alternative methodologies and conceptual frameworks and their application to selected current research issues central to the development of accounting thought, both theoretical and empirical. Prerequisite: Accountancy 462 and 481 and courses in behavioral science, mathematics, and economics, or equivalent background and admission to the accountancy Ph.D. program; or consent of instructor. 1 unit.
492. **Doctoral Research Seminar.** Seminars in various accounting areas designed to enhance the research abilities of doctoral students and to assist them in preparing research proposals; these include Behavioral Dimensions, Public Sector, Tax, Auditing, Managerial, and others announced in the Timetable. 1 unit. May be repeated.
493. **Special Research Problems.** Individual investigations or research projects selected by the students, subject to approval by the graduate adviser and the executive officer of the department. 1/4 to 2 units.
494. **Methods and Practices in Professional Research.** Instruction in research methods, materials, and techniques together with individual practice in conducting and reporting specific professional research projects. 1 unit.
495. **Information Systems and Inquiry Processes.** An investigation of systems theory and methodology as a basis for generating knowledge useful in action to achieve social goals. 1 unit.
499. **Thesis Research.** Individual direction and guidance in writing theses; seminar discussion of progress made. 0 to 4 units

ADMINISTRATION, HIGHER, AND CONTINUING EDUCATION

Acting Chairperson of Department: Associate Professor P. W. Thurston

Department Office: 333 Education Building, 1310 S. Sixth, Champaign

- 199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 267. **The American College.** A survey of the American college and university; its history, structures, problems, trends, and governance. Provides an opportunity to explore the nature and scope of higher education in the United States. 3 hours.
- 362. **Adult Learning and Development.** Same as Educational Psychology 362. Theory of and research on adult learning and development; includes societal context, performance, physiology and health, personality, and learning; and considers stability and change during young adulthood, middle age, and old age. Prerequisite: Educational Psychology 311 or 312, or equivalent, or consent of instructor. 4 hours or 1 unit.
- 363. **Instructional Design.** Same as Educational Psychology 363. See Educational Psychology 363.
- 380. **Continuing Education General Seminar.** Introductory analysis of literature and professional practice in continuing education of adults; for beginning graduate students majoring in continuing education and for non-majors. 2 or 4 hours, or 1/2 or 1 unit. May be repeated to a maximum of 8 hours or 2 units.
- 418. **Economics of Education, Health, and Human Capital.** Same as Economics 418. See Economics 418.
- 430. **Elementary School Organization and Administration.** Focuses principally on the conceptual analysis of administrative and supervisory functions of the elementary school; examines administrative roles in the design, implementation, and improvement of the total educational program. Problems are projected through case studies and situational descriptions as a means of examining administrative tasks and processes. Prerequisite: Administration, Higher, and Continuing Education 450 or consent of instructor. 1 unit.
- 433. **Clinical Supervision of Instruction.** Same as Secondary Education 433. See Secondary Education 433.
- 438. **Instructional Supervision.** Methods, theories, and research applying to supervision in education; analyzes the work of curriculum directors, supervisors, supervising principals, and department heads; studies supervisory methods, staff utilization, and staff development; and stresses evaluation of educational programs and the effects of supervision. 1 unit.
- 440. **Administration and Supervision of Junior and Senior High Schools.** Focuses principally on conceptual analyses of administrative and supervisory functions of the secondary schools. Problems are projected through case studies and situational descriptions as a means of examining tasks and processes in such areas as curriculum and instruction, pupil and staff personnel, student activities, school organization, and management and school-community relationships. Prerequisite: Administration, Higher, and Continuing Education 450 or consent of instructor. 1 unit.
- 442. **The Community College.** Same as Vocational and Technical Education 442. Community colleges and vocational-technical institutes: their purposes, function, and objectives; social forces related to their development and evaluation; characteristics and needs of students; educational programs and teaching strategies; and organization, control, and financing. 1 unit.
- 443. **The College Student.** Study of the characteristics and development of college students, the institutional contexts in which they operate, and the interaction of students with the college environment. 1 unit.
- 448. **Continuing Education Program Development.** Same as Secondary Education 448 and Vocational and Technical Education 448. Analysis of the process of planning and conducting continuing education programs for adults; includes theory, research, and practice regarding sponsors, need appraisal, objectives, selection and organization of learning activities, and evaluation. Recommended for majors in continuing

education. Prerequisite: Consent of instructor. Administration, Higher, and Continuing Education 362 is recommended, especially for majors in continuing education. 1 unit.

- 449. Independent Study.** Offers opportunity and challenge of self-directive, independent study, that is, develops the individual's ability as an independent student, and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department chairman prior to enrollment. 1/2 to 1 unit. No more than 2 units may be offered toward an advanced degree except by consent of the Dean of the College of Education.
- 450. Public Control and Administration of Education.** Provides the basic common understanding of theory and practice in operation and control of schools useful to teachers and other citizens; analyzes both formal and informal influences on governance; and serves as an introductory course for prospective administrative officers and supervisors. Not open to experienced administrators nor to students who have taken any of the following (or equivalents): Administration, Higher, and Continuing Education 430, 440, 461, 462, 463, 465, 466. 1 unit.
- 452. Current Issues in Higher Education.** Seminar on current issues, problems, and trends in higher education. Prerequisite: Two units in higher education or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 461. Administration of Educational Programs and Personnel.** Study of principles and criteria for analysis of programs at various levels of operation, such as individual departments, schools, school systems, intermediate units, state education departments, and the federal government. This course and Administration, Higher, and Continuing Education 462 and 463 and Educational Psychology 413 constitute the required core program for all students specializing in educational administration who are candidates for a degree beyond the master's. Prerequisite: Admission to post-master's degree program in Administration, Higher, and Continuing Education; Administration, Higher, and Continuing Education 450, and 430 or 440; or consent of instructor. 1 unit.
- 462. Organization and Business Administration of Public Education.** Organization and operation of public school government; functions and processes of school business administration, including internal organization of the division of business services; and scope and role of the business manager, budgetary process, accounting and financial reporting, contracts, liability, insurance, purchasing, auxiliary services, salary policies, and methods of survey, evaluation, and planning. Prerequisite: Administration, Higher, and Continuing Education 450, 430 or 440, and 461. 1 unit.
- 463. The Role of Administrative Leadership.** Study of perspectives on administrative leadership drawn from the social sciences and their application to the analysis and formulation of strategies for performing leadership functions in educational administration. Prerequisite: For majors in educational administration, Administration, Higher, and Continuing Education 461 and Educational Psychology 413; for students in other departments, admission to a post-master's degree program and consent of instructor. 1 unit.
- 464. Directed Field Experience in Administration.** Direct experience in the study of educational problems of concern to administrators; features an action component whereby the student is provided with opportunities for assuming responsibility for decision making in a live or simulated setting; each student works under the supervision of a professor, and where possible and appropriate, a practicing administrator. 1 to 3 units. May be repeated to a maximum of 3 units, with no more than 1 unit earned at the master's level.
- 465. Personnel Administration.** Principles, problems, and trends in the administration of professional public school personnel; organization of personnel; assessment and definition of personnel needs; recruitment, selection, and induction; evaluation; personnel development programs; and teacher organizations. Prerequisite: Administration, Higher, and Continuing Education 430 or 440, and 450. 1 unit.

- 466. Public School Finance.** Advanced graduate study of the theory and technology of public school finance; attention centered on analysis of principles and theory underlying fiscal practice in various states; technical knowledge of designing controls, organization, and fiscal systems in harmony with expressed theory; and the application of research to the analysis of problems related to the improvement of financing public schools. Prerequisite: Admission to advanced graduate program in the Department of Administration, Higher, and Continuing Education, or consent of instructor. 1 unit.
- 468. School-Community Relations.** Study of the relationship of the American school to the community; analysis of the power structure, social agencies, school liaison groups, and economic character of the community as they affect and are affected by the school; and evaluation of the various media of communication between the school and the larger community, and the development of criteria for an effective program of school-community relations. 1 unit.
- 469. Legal Basis of School Administration.** Legal rights, privileges, responsibilities, immunities, and authority of pupils, parents, teachers, administrators, and school board members in relation to the school. 1 unit.
- 471. State and Federal Educational Politics and Policies.** An examination of the legislative and political processes in the formulation of current federal and state educational policies, together with the evaluation of policy and the formulation of policy alternatives. Prerequisite: Administration, Higher, and Continuing Education 469. 1 unit.
- 474. The American College and University.** Introduction to higher education as a subject: its history, purposes, leaders, and literature; attention to conceptual framework in which further development of this subject can progress. 1 unit.
- 475. Administration of Higher Education.** Administrative practices, procedures, and arrangements for policy implementation in the American college (including the community college) and university; special attention given to the roles of major administrative officers. Prerequisite: Administration, Higher, and Continuing Education 442 or 474, or equivalent. 1 unit.
- 477. Student Personnel Work in Higher Education.** Study of theoretical foundations and principles underlying the practice of student personnel work; investigation of the role and function of student personnel workers in terms of their relationship to various goals, philosophies, issues, trends, and research. 1 unit.
- 478. The Administration of Student Personnel Work.** Structural arrangements for meeting student-oriented needs in the American college (including the junior college) and university; attention to the role of the chief administrative officer for student affairs. Prerequisite: Administration, Higher, and Continuing Education 477 or equivalent. 1 unit.
- 479. Organization and Control of Higher Education.** Organizational patterns whereby colleges and universities seek to accomplish their purposes; agencies involved in the control of higher education. Prerequisite: Administration, Higher, and Continuing Education 442 or 474, or equivalent. 1 unit.
- 480. Internship in the Administration of Higher Education.** Designed to provide supervised direct experience in the administration of higher education; with the aid of the faculty, students select the institution and position most relevant to their career goals. Prerequisite: Consent of instructor. 1 unit. No more than 2 units may be offered toward an advanced degree.
- 483. Societal Context of Continuing Education.** Analysis of the continuing education agency as a social system; includes learning group, planning committee, organizational relations with parent institution, and linkage with community; recommended for majors in continuing education. Prerequisite: A basic graduate course on social systems (such as Educational Psychology 413, Educational Policy Studies 315 or 385, Sociology 456 or 492, or Psychology 355). 1 unit.
- 484. Continuing Education Internship.** Supervised field experience. Prerequisite: Consent of instructor. 1 to 2 units. May be repeated to a maximum of 4 units.

- 485. **Continuing Education Agency Administration.** Organization and administration of continuing education programs for adults; decision making, policy, finance, personnel, program, and community relations; analysis of theory, research, and practice; and emphasis on case analysis. Recommended for majors in continuing education. Prerequisite: Administration, Higher, and Continuing Education 483 and a basic administration course (such as Administration, Higher, and Continuing Education 450 or 479, Vocational and Technical Education 489, Library Science 405, or Business Administration 401). 1 unit.
- 486. **Continuing Education Advanced Seminar.** Analysis of specialized topics related to continuing education of adults; for advanced students. Recommended for majors in continuing education. Prerequisite: Consent of instructor. 1/2 or 1 unit. May be repeated to a maximum of 3 units.
- 490. **Seminar for Advanced Students of Education.** Open only to persons who have been admitted for doctoral study in the Department of Administration, Higher, and Continuing Education. Prerequisite: Consent of instructor. 1 to 2 units.
- 491. **Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems; students are expected to present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze all presentations critically. Prerequisite: Consent of instructor. 1 to 2 units.
- 497. **Collective Bargaining in Public Employment.** Same as Labor and Industrial Relations 497, Social Work 497, and Political Science 469. See Labor and Industrial Relations 497.
- 499. **Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units

ADVERTISING

Head of Department: Professor A. M. Barban

Department Office: 103 Gregory Hall, 810 S. Wright, Champaign

- 199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 281. **Introduction to Advertising.** A survey of the economics, psychology, and philosophy of advertising; preparation of advertisements; selection of media; and organizational structure. Not open to seniors unless enrolled in the College of Communications. Prerequisite: Sophomore standing and consent of department. 3 hours.
- 288. **Sales Writing.** Same as Business and Technical Writing 271. See Business and Technical Writing 271.
- 291. **Special Problems.** Special projects, research, and independent reading in advertising for students capable of individual work under the guidance of a faculty adviser. Prerequisite: Written research proposal and consent of head of department. 2 or 3 hours.
- 309. **Public Relations.** Publicity methods and public relations; representation of profit and nonprofit institutions to the public; use of communications research and media; and preparation of public relations campaigns. Prerequisite: Junior standing in the College of Communications; consent of department. 3 hours or 1/2 unit.
- 381. **Advertising Research Methods.** Quantitative techniques and research methodology in advertising; philosophy of science, statistical methods, survey and experimental design, etc; emphasis on the problems of advertising research. Prerequisite: Advertising 281; junior standing; a specified course in statistical methods; consent of department. 3 hours or 1/2 unit.
- 382. **Advertising Creative Strategy and Tactics.** Theory and practice of advertising message planning and creation for print and broadcast media; use of consumer and market surveys, copytesting methods, and advertising readership studies.

- Prerequisite: Advertising 281; junior standing; consent of department. 3 hours or 1/2 unit.
383. **Advertising Media Strategy and Tactics.** Analysis of the various advertising media in terms of markets served and factors to consider in the selection of media. Prerequisite: Advertising 281; junior standing; consent of department. 3 hours or 1/2 unit.
389. **International Advertising and Promotion.** The role of advertising and promotion in international communication and economic development; behavioral science approach to international communication strategy; and comparative analysis of advertising and promotion systems. Prerequisite: Advertising 281; junior standing; consent of department. 3 hours, or 1/2 or 1 unit.
390. **Advanced Creative Strategy and Tactics.** Advanced work in application of behavioral science and creative process to planning and writing of advertisements. Prerequisite: Advertising 382; consent of department. 3 hours, or 1/2 or 1 unit.
391. **Advertising Management: Planning.** Analysis of actual advertising situations through the case method and study of how such situations might be met; covers all of the decision making areas of advertising. Prerequisite: Advertising 381, 382, and 383; Mathematics 111, or 112, or equivalent; Business Administration 202; consent of department. 3 hours or 1/2 unit.
392. **Advertising Management: Strategy and Tactics.** Application of advertising management decision criteria to actual communication problems involving advertisers; development of strategy and tactics. Prerequisite: Advertising 391; consent of department. 3 hours or 1/2 unit.
393. **Advertising in Contemporary Society.** A study of advertising as an institution and its role in communications, society, our economy, and business. Prerequisite: Advertising 281; senior standing; consent of department. 3 hours or 1/2 unit.
481. **Economic and Social Aspects of Advertising.** Same as Communications 481. An examination of advertising as an institution; the economic, social, and legal aspects of advertising with focus on current problems. Prerequisite: Advertising 391, 393, and consent of department. 1 unit.
482. **Research Methods in Advertising and Communications.** Same as Communications 482. A treatment of basic research concepts and procedures in the social sciences with emphasis on advertising and communications; examination of both nonquantitative and quantitative methods. Prerequisite: Advertising 381, a basic course in statistical methods, and consent of department. 1 unit.
483. **Advertising as Communication.** Advertising messages from the perspective of communication and mass communication theories; application of theory to advertising communication problems. Prerequisite: Advertising 382 and consent of department. 1 unit.
484. **Advertising and Consumer Behavior.** An examination of consumer behavior as a means of shaping the communications message; use of the behavioral sciences in creative communication strategy. Prerequisite: Advertising 391 and consent of department. 1 unit.
485. **Advertising Planning and Decision Making.** Same as Communications 485. An examination of the theoretical foundations of decision theory as they relate to planning and decision making in advertising; use of decision models in the development of strategies and tactics. Prerequisite: Advertising 391 and consent of department. 1 unit.
486. **Analytical Methods in Advertising and Communications.** Same as Communications 486. Seminar emphasizing fundamental problems in advertising and communications and the methods applicable to their solution; problem areas covered include aspects of message-related issues and response functions building and usage; applies methods drawn from various disciplines to these problem areas; and applies analyses on pre-collected advertising and communications data using computerized statistical program packages. Prerequisite: Advertising 391 and a specified course in statistical methods. 1 unit.
490. **Special Topics in Advertising.** Prerequisite: Consent of department. 1/2 or 1 unit.

499. **Thesis Research.** Prerequisite: Graduate standing in advertising. 1 to 2 units

AERONAUTICAL AND ASTRONAUTICAL ENGINEERING

Head of Department: Professor H. H. Hilton

Department Office: 101 Transportation Building, 104 S. Mathews, Urbana

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
212. **Aerodynamics, I.** Quasi-one-dimensional flow; conservation of mass, momentum, and energy; steady flow with variable area; steady, constant area flow with friction, heat addition, and mass injection; shock waves; nonsteady, one-dimensional flows; and two-dimensional flow, oblique shock waves, and Prandtl-Meyer waves. Prerequisite: Mechanical Engineering 207; Theoretical and Applied Mechanics 156; credit or concurrent registration in Mathematics 343. 4 hours.
213. **Aerodynamics, II.** Equations of motion for a viscous, heat-conducting fluid; exact solutions of the Navier-Stokes' equations; boundary layer theory; inviscid approximations, vorticity, and circulation; potential flow; solutions of potential flow equations, sources, sinks, and Prandtl-Meyer flow; thin airfoil and slender body theory; and method of characteristics. Prerequisite: Aeronautical and Astronautical Engineering 212. 4 hours.
224. **Flight Structures, I.** Development of fundamental concepts of elasticity as related to stress, strain, equilibrium, compatibility, and material properties; applications to flight vehicle structural problems in unsymmetric bending, torsion, thick-walled cylinders, rotating discs, shear flow, and shear center problems. Prerequisite: Mathematics 345; Theoretical and Applied Mechanics 156. 4 hours.
225. **Flight Structures, II.** Energy concepts with applications to indeterminate flight structures, sandwich beams, and shear flow; elastic and plastic buckling of columns and plates; and membrane theory of shells. Prerequisite: Aeronautical and Astronautical Engineering 224. 4 hours.
233. **Aircraft Propulsion.** Fundamentals of air breathing jet propulsive devices; prediction of thrust, specific fuel consumption, and operating performance; ramjets; turbojets; turboprops; turboprops; aerothermodynamics of inlets, combustors, and nozzles; compressors, turbines, and propellers; and component matching. Prerequisite: Aeronautical and Astronautical Engineering 212 or first course in gas dynamics. 3 hours.
241. **Flight Vehicle Design.** Introduction to preliminary design of airplanes, missiles, and space vehicles; further development of concepts in orbital mechanics, hypersonic aerodynamics, and aerodynamic heating. Prerequisite: Aeronautical and Astronautical Engineering 213, 225, 233, and 255; Computer Science 101. 3 hours.
254. **Aerospace Dynamic Systems, I.** Aerospace system components and block diagrams; single degree-of-freedom dynamic and linear feedback control systems; Laplace transforms, time domain, and frequency response techniques; the characteristic equation and stability criteria; and introduction to inertial guidance and analog computers. Prerequisite: Mathematics 345. 3 hours.
255. **Aerospace Dynamic Systems, II.** Hamilton's principle and Lagrange's equation; fundamentals of orbital mechanics and trajectory optimization; multiple degrees of freedom; dynamic systems and continuous elastic structures; divergence and flutter of lifting surfaces; flight vehicle performance, stability, and control; and large disturbance maneuvers. Prerequisite: Aeronautical and Astronautical Engineering 254. 4 hours.
260. **Aerospace Laboratory.** Theory and application of experimental techniques in aeronautical and astronautical engineering. Prerequisite: Aeronautical and Astronautical Engineering 213, 225, 233, and 255. 2 hours.
280. **Energy Alternatives and Societal Values: Technology Assessment for Non-Engineers.** The energy/environment crisis as a societal problem. Energy

alternatives: their technology, potential, and human and environmental consequences. Values, technology, and the social construction of future reality. Introduction to the information, ideas, values, and perceptions currently affecting the societal definition and resolution of the energy/environment problem. Student participation in simulated adversary proceedings, role-playing, panel discussions, and values-clarification and problem-clarification strategies. Lectures and extensive readings. 4 hours.

- 281. Introduction to Renewable Energy Sources.** The technology of renewable energy sources: wind power and the performance of large and small wind turbine systems; ocean thermal energy conversion and ocean wave power; solar thermal electric power; solar cells; the elements of design and sizing of solar heating and cooling systems; hydroelectric power; biomass fuels; hydrothermal-reservoir and dry-rock geothermal energy; energy storage; on-site energy systems; the concept of appropriate technology; and the economics of renewable energy systems. Prerequisite: Mathematics 130 or 131, and Physics 102 or 108; or consent of instructor. 3 hours.
- 292. Seminar.** Reports and discussions of recent developments in the fields of aerodynamics, flight mechanics, power plants, structures, and maintenance and operations as related to airplanes, missiles, and space vehicles. Prerequisite: Senior standing. 1 hour.
- 296. Honors Project.** A special project or reading course for James Scholars in engineering. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
- 297. Honors Seminar.** Special lecture sequences and/or discussion groups arranged each semester to bring James Scholars in engineering into direct contact with the various aspects of engineering practices and philosophy. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
- 303. The Effect of Space Environment on Satellite Motion.** Free molecule aerodynamics; gravity gradient and solar radiation torques on satellites; interaction of on-board magnetic dipoles with the earth's magnetic field; solar wind; cosmic dust and micrometeoroid torques; lifetime problem and density determination; and utilization of these various environmental effects in satellite attitude control. Prerequisite: Aeronautical and Astronautical Engineering 213. 3 hours, or 3/4 or 1 unit.
- 306. Orbital Mechanics.** Analysis of orbits in an inverse-square gravitational field; elementary rocket dynamics, impulsive orbit transfer and rendezvous, and Lambert's Theorem with applications; and patched-conic trajectories, planetary swing-by maneuvers, and linearized orbit theory with application to simplified analytical models. Prerequisite: Aeronautical and Astronautical Engineering 255, Theoretical and Applied Mechanics 212, or consent of instructor. 3 hours, or 3/4 or 1 unit.
- 311. Aerodynamics of Compressible Fluids.** Methods of solution of fluid flow problems in subsonic, transonic, and supersonic flight regimes. Prerequisite: Aeronautical and Astronautical Engineering 213. 3 hours, or 3/4 or 1 unit.
- 313. Aerodynamics of Incompressible Fluids.** Governing equations for incompressible flow; vorticity, circulation, and Kelvin's, and Helmholtz's theorems; velocity potential and stream function; three-dimensional steady and nonsteady flows, d'Alembert's paradox, and apparent mass; two-dimensional steady flows, complex potential and velocity, and mapping of flows; two-dimensional airfoils and Joukowski transformation and airfoils; and thin airfoil theory. Prerequisite: Aeronautical and Astronautical Engineering 213 or equivalent, or consent of instructor. 3 hours, or 3/4 or 1 unit.
- 314. Aerodynamic Heat Transfer.** Thermal boundary layers; turbulent heat transfer; aerodynamic heating; and radiative heat transfer. Prerequisite: Aeronautical and Astronautical Engineering 213. 3 hours, or 3/4 or 1 unit.
- 316. Applied Aerodynamics.** Two-dimensional and finite wing theory with emphasis on the mechanisms of lift and drag generation; Reynolds number and Mach number effects; drag analysis; high-lift wing systems; propeller and rotor aerodynamics; control surface design; and application of V/STOL aerodynamics. Prerequisite:

Aeronautical and Astronautical Engineering 213 or consent of instructor. 3 hours, or 3/4 or 1 unit.

317. **Elements of Magnetohydrodynamics.** Equations of magnetohydrodynamics; single-fluid and multiple-fluid models; magnetic interaction parameters; magnetosonic waves; hydromagnetic shock waves; aligned-field and crossed-field flows; theory of characteristics; MHD acceleration generation; and propulsion. Prerequisite: Aeronautical and Astronautical Engineering 212 or consent of instructor. 3 hours or 1 unit.
319. **Aircraft Flight Mechanics.** Steady and quasi-steady aircraft flight performance; take-off and landing, climbing and diving, cruise, level turn, and introduction to energy methods; longitudinal, directional, and lateral static stability and control; and introduction to longitudinal and lateral motion and dynamic stability. Research paper required for 1 unit credit. Prerequisite: Aeronautical and Astronautical Engineering 213, 233, and 255, or consent of instructor. 3 hours, or 3/4 or 1 unit.
326. **Theory of Continuous Media.** Introduction to the general theory of continuous media and its application to the theories of elasticity, fluid mechanics, and inelasticity; stress and strain tensors and their invariants; nonlinear equilibrium conditions; the mechanism of deformation of single crystal and polycrystalline media; basic concepts of the structure of matter; thermodynamic considerations; and equations of state and stress-strain relationships with applications. Prerequisite: Consent of instructor. 3 hours or 1 unit.
331. **Properties of Gases.** The fundamental principles of kinetic theory and of classical and statistical thermodynamics are reviewed as a basis for treating gas imperfection, dissociation, chemical reactions, ionization processes, transport properties, and relaxation phenomena. With this base, the fundamental equations of reactive flow are derived and applied to the description of quasi-one-dimensional nozzle flow and shock wave structure. Prerequisite: Aeronautical and Astronautical Engineering 213. 3 hours or 3/4 unit.
333. **Electric Propulsion.** Elements of propulsion as applied to deep space missions; physics of ionized gases; plasmadynamics; electrothermal, electromagnetic, and electrostatic acceleration of gases to high velocity; high-impulse thruster design and performance; and the resistojet, arcjet, ion engine, MPD arc, and plasma gun. 3 hours or 1 unit.
334. **Rocket Propulsion and Rocketry.** Basic principles of rocket propulsion and rocketry, propellants and their influence on design of rockets, internal and external ballistics, combustion processes, design of components, flight performance, and rocket testing. Prerequisite: Aeronautical and Astronautical Engineering 212 or equivalent. 3 hours or 3/4 unit.
335. **Air Pollution and Combustion.** Same as Mechanical Engineering 333 and Civil Engineering 358. Natural and man-made pollutants in the atmosphere; fundamentals of stoichiometry, reaction kinetics, and chemical equilibrium as applied to pollutants and their reactions in the air; and all combustion devices which make major contributions to air pollution, and current and possible control techniques for these devices. Prerequisite: Chemistry 102 and Mechanical Engineering 205 or 207, or consent of instructor. 3 hours, or 3/4 or 1 unit.
351. **Aeroelasticity and Aeroinelasticity.** Advanced fundamental treatment of aerodynamic and dynamic structural phenomena associated with flexible airplanes and missiles; divergence of linear and nonlinear elastic lifting surfaces; effect of elastic and inelastic deformations on lift distributions and stability; elastic flutter of straight and swept wings; equations of disturbed motion of elastic and inelastic aircraft; dynamic response to forces, gusts, and continuous atmospheric turbulence; creep divergence of lifting surfaces; flutter in the presence of creep; and effect of temperature on inelastic divergence and flutter. Prerequisite: Aeronautical and Astronautical Engineering 255. 3 hours or 1 unit.
381. **Wind Power Technology.** Aerodynamic, electromechanical, and structural design of wind power systems; classical windmills; modern wind power generators; wind characteristics and distribution; instrumentation and measurement; energy storage

considerations; socioeconomics of wind power systems; performance of large and small scale wind turbines; and current design approaches. Prerequisite: Aeronautical and Astronautical Engineering 213, Chemical Engineering 371, Mechanical Engineering 211, or Theoretical and Applied Mechanics 235, or equivalent; and Electrical Engineering 220 or equivalent; and Aeronautical and Astronautical Engineering 255, Mechanical Engineering 220, or Theoretical and Applied Mechanics 311, or equivalent. 3 hours, or 3/4 or 1 unit.

391. **Special Problems.** Special problems relating to the theory, design, testing, operation, maintenance, or production of airframes or aircraft power plants. Prerequisite: Senior standing in engineering; consent of instructor. 1 to 4 hours, or 1/2 to 1 unit.
414. **Boundary Layer Theory.** Theories of the boundary layer of a compressible fluid and their solutions, laminar and turbulent; boundary layer in hypersonic flows. Prerequisite: Aeronautical and Astronautical Engineering 213. 1 unit.
415. **Wing Theory.** Theoretical analysis of the aerodynamic characteristics of two- and three-dimensional wings and multiple-body systems in subsonic and supersonic flows. Prerequisite: Mathematics 346 or equivalent. 1 unit.
417. **Fundamentals of Gas Kinetics.** Fundamental concepts required to study gas dynamic problems from the viewpoint of kinetic theory; derivation of the Boltzmann equation from classical mechanics; reduced and truncated distribution functions and the BBGKY hierarchy; molecular collisions; flux vectors and equations of change; moment equations; summational invariants; H-theorem and Maxwellian distribution; inclusion of the effect of solid surfaces in kinetic theory; existence theory for the Boltzmann equation; iteration procedures; moment methods; Chapman-Enskog procedure; and first and second approximations to the distribution function, heat flux vector, and stress tensor. Prerequisite: Aeronautical and Astronautical Engineering 213 or equivalent, or consent of instructor. 1 unit.
418. **Theory of Rarefied Gas Flows.** Application of kinetic theory to rarefied gas flow problems; free-molecule flow; near free- molecule flow; linearized problems; and flows with appreciable deviation from equilibrium. Prerequisite: Aeronautical and Astronautical Engineering 417. 1 unit.
428. **Theory of Large Deformations in Nonlinear Continuous Media.** Fundamental concepts of large deformations in nonlinear elasticity and inelasticity with applications: generalized tensors, finite deformations, stress-strain relations in terms of strain energy functions, solutions of tension, shear and bending problems, finite plane strain, theory of successive approximations, fiber-reinforced beams, plates and cylinders, thermodynamics of deformable media, stability considerations, and constituent relations for inelasticity. Prerequisite: Aeronautical and Astronautical Engineering 326 or equivalent. 1 unit.
429. **Theory of Linear and Nonlinear Viscoelasticity.** Same as Theoretical and Applied Mechanics 429. Fundamental concepts of viscoelasticity with applications: elastic-viscoelastic analogies, creep and relaxation functions, thermomechanical reciprocity relations, variational principles, model fitting, shear center motion, thick-walled cylinders under pressure and inertia loads with material annihilation, sandwich plates, propagation of viscoelastic waves, vibration of bars, plates and shells, nonlinear elastic-viscoelastic analogy, properties of nonlinear viscoelastic stress-strain laws, creep rupture, and torsion of nonlinear bars and shells. Prerequisite: Aeronautical and Astronautical Engineering 326 or consent of instructor. 1 unit.
434. **Aerodynamic Heating.** Theory of convective aerodynamic heating in high-speed flow and laminar and turbulent flows; ablation, transpiration cooling, and mass transfer cooling; aerodynamic heating in hypersonic flow, real gas effects, and effect of pressure interactions and vorticity interactions; and heat transfer in rarefied gas flows. Prerequisite: Aeronautical and Astronautical Engineering 414 or equivalent. 1 unit.
438. **Fundamentals of Combustion.** Same as Mechanical Engineering 403. Fundamentals of kinetic theory, transport phenomena, chemical equilibria, and

reaction kinetics; flames, their gross properties, structure, and gas dynamics including oscillatory and turbulent burning; solid and liquid propellant combustion; one-dimensional detonation theory including structure and initiation; three-dimensional and other complex detonation waves; and supersonic burning. Prerequisite: Aeronautical and Astronautical Engineering 213 or Mechanical Engineering 305. 1 unit.

- 452. **Stochastic Structural Dynamics.** Same as Theoretical and Applied Mechanics 417. Structural dynamics problems treated from a probabilistic point of view; theory of probability and random processes introduced as mathematical tools; response of structures under random excitation is studied in order of increasing complexity; and probability of failure for such structures is discussed. Prerequisite: Aeronautical and Astronautical Engineering 255, Theoretical and Applied Mechanics 314, or equivalent. 1 unit.
- 453. **Aerodynamic Noise.** Same as Theoretical and Applied Mechanics 418. Mathematical techniques for the analysis of intensity, spectrum, and directivity of noise field in various environments; practical examples including jet and rocket engines, propeller and fan, sonic boom, and cabin noise of high speed vehicles. Prerequisite: Graduate standing in engineering, physics, or mathematics. 1 unit.
- 490. **Seminar.** Presentation by graduate students and staff of current topics in the field of aeronautics. Prerequisite: Graduate standing in aeronautical and astronautical engineering. 0 credit.
- 493. **Special Problems.** Theoretical and experimental investigations of problems in airplane, missile, and space flight engineering. 1/2 to 2 units.
- 499. **Thesis Research.** Research in the various areas of the aeronautical and astronautical engineering sciences. 0 to 4 units

AFRICAN STUDIES

Director of Program: Professor C. C. Stewart

Program Office: Room 101, 1208 West California Street, Urbana

- 199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. **Elementary Swahili, I.** Same as Swahili 201. See Swahili 201.
- 202. **Elementary Swahili, II.** Same as Swahili 202. See Swahili 202.
- 210. **Introduction to Modern African Literature.** Same as Comparative Literature 210 and English 211. Significant contemporary African writings depicting the history and cultural traditions of African peoples. 3 hours.
- 222. **Introduction to Modern Africa.** Same as Anthropology, Political Science, and Sociology 222. An interdisciplinary introduction to Africa dealing with basic themes and problems in the politics, economics, sociology, anthropology, and history of Africa. 3 hours.
- 303. **Intermediate Swahili, I.** Same as Swahili 303. See Swahili 303.
- 304. **Intermediate Swahili, II.** Same as Swahili 304. See Swahili 304.
- 305. **Advanced Swahili, I.** Same as Swahili 305. See Swahili 305.
- 306. **Advanced Swahili, II.** Same as Swahili 306. See Swahili 306.
- 310. **Modern African Fiction.** Same as Comparative Literature and French 310 and English 370. Examination of selected major African novels along thematic and formal lines; literary responses to colonialism and political independence and the crises that accompanied both in Africa; and study of critical approaches to the African novel and African characteristics of and contribution to the novel as a genre. Readings in English. Prerequisite: African Studies 210 or 222, or junior standing. 3 hours or 1 unit.
- 325. **Southern Africa: Race and Power.** Same as History 325 and Political Science 333. An interdisciplinary survey of both the internal and international dimensions of the changing situation in Africa south of the Zambezi; focuses on the historical

background to, and a political, economic, and social analysis of current events in the Republic of South Africa, Mozambique, Namibia, and Zimbabwe, emphasizing the central significance of race and power in this region. Prerequisite: History 216 or African Studies 222. 3 hours or 1 unit.

450. **Seminar on Selected Topics in African Studies.** Topics vary with the disciplinary focus. Prerequisite: Consent of instructor. 1/2 or 1 unit. May be repeated to a maximum of 3 units

AFRO-AMERICAN STUDIES

Director of Program: Professor G. A. McWorter

Program Office: 1204 West Oregon Street, Urbana

161. **Black Folk Culture.** Same as Anthropology 161. See Anthropology 161.
 199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
 227. **Black Experience in Hispanic Literatures.** Same as Spanish 227. See Spanish 227.
 253. **Afro-American History to 1877.** Same as History 253. See History 253.
 254. **Afro-American History Since 1877.** Same as History 254. See History 254.
 259. **Afro-American Literature, I.** Same as English 259. See English 259.
 260. **Afro-American Literature, II.** Same as English 260. See English 260.
 261. **Afro-American Societies and Cultures.** Same as Anthropology 261. See Anthropology 261.
 298. **Special Topics in Afro-American Studies.** Advanced seminar on selected topics with particular emphasis on current research trends. Prerequisite: Junior status and one of the following: History 253 or 254 or English 259 or 260. 3 hours. May be repeated to a maximum of 6 hours.
 327. **Black Political Participation in the American Political Process.** Same as Political Science 327. See Political Science 327.
 353. **Afro-American Intellectual History.** Same as History 353. See History 353.
 368. **The South in American History.** Same as History 368. See History 368.
 379. **Slavery and Race Relations in Latin America.** Same as History 379. See History 379

AGRICULTURAL COMMUNICATIONS

Head of Office: Professor D. T. Dahl

Office: 67 Mumford Hall, 1301 West Gregory, Urbana

106. **Functional Writing.** Instruction and practice in functional writing related to unique interests of students in the College of Agriculture; designed primarily to be taken with freshman rhetoric by students with special needs for improvement in their use of English. Restricted to students in the College of Agriculture. 1 to 2 hours.
 114. **Agricultural Communications Media and Methods.** Same as Journalism 114. Introduction to print, broadcast, visual, and other major communications media used to convey agricultural information; development of basic skills in communicating through those media. Prerequisite: Completion of rhetoric requirement. 3 hours.
 190. **Field Study Tour.** Observation of professional agricultural communications operations through on-site group visits; travel expenses involved. 1 hour. May be repeated to a maximum of 4 hours.
 214. **Agricultural Communications Strategy.** Same as Journalism 214. Coordinated approach to planning and carrying out programs of agricultural information and education using a variety of communications media; students apply principles of

- strategy to actual communications problems of their choice. Prerequisite: Agricultural Communications 114 or consent of instructor. 3 hours.
240. **Photography in Agriculture.** Application of visual communications principles to agriculture using the photograph as medium; emphasizes communicative, creative, and technical aspects. See Timetable for approximate cost of materials. Prerequisite: Agricultural Communications 114; consent of instructor. 4 hours.
290. **Professional Seminar.** Professional developments and issues in agricultural communications; the agricultural communicator today; and avenues for continuing professional growth. Prerequisite: Junior-senior standing in agricultural communications. 1 hour.
300. **Special Problems in Agricultural Communications.** Special projects, research, and independent study in agricultural communications. Prerequisite: Agricultural Communications 114 or equivalent; written consent of instructor and authorized departmental approval prior to advance enrollment and registration; not open to students on probation. Specific approval of the associate dean is required in advance of registration for a second and/or third special problems course. 1 to 5 hours, or 1/2 to 2 units.
320. **Agriculture and Its Publics.** Communications analysis of major interactions between agriculture and other segments of American society. Prerequisite: Six hours of social science. 3 hours or 3/4 unit.
460. **Teaching of College-Level Agriculture.** Analysis and preparation for the problems encountered in the effective teaching of college-level agriculture and home economics; systems approach, including instructional objectives, preassessment of students, instructional strategies, materials, and student performance evaluation; and detailed study of individual problems supplements class work. Prerequisite: Master's standing. 1/2 unit.
461. **Extension Communications Management.** Analysis and management of effective extension communications based on present communication and educational concepts. 1 unit

AGRICULTURAL ECONOMICS

(Including Rural Sociology)

Head of Department: Professor W. D. Seitz

Department Office: 304 Mumford Hall, 1301 W. Gregory, Urbana

Agricultural Economics

100. **Introductory Agricultural Economics.** Principles of production, supply, and demand applied to economic problems of agriculture and agriculturally related industries and to decisions in farm management, marketing, foreign trade, and agricultural policy; the role in economic growth of natural resources, population, and capital. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Problems in Agricultural Economics.** Individual research work under the supervision of senior members of the staff in the following fields: agricultural credit and finance; agricultural law; agricultural marketing; agricultural policy; agricultural prices; farm management; land economics; rural organization; and statistical analysis. Students may receive credit for research in preparing for intercollegiate debating and speaking on problems in agricultural economics when such opportunities exist. Prerequisite: Not open to students on probation; written consent of instructor and authorized departmental approval are required prior to advance enrollment and registration. The honors section is open to James Scholars

and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department subject to approval of the instructor. 1 to 5 hours.

203. **Farm Taxation.** Federal, state, and local taxation with emphasis on their application to farm income, farm property, farm property transfers, and agricultural cooperatives; introductory material on the uses and sources of revenue. 2 hours.
220. **Farm Management.** Economic principles applied to management of farms; budgeting; crop and livestock systems; record analysis; financial management; farm leases; and problems in resource appraisal and business reorganization. Field trip required; see Timetable for approximate cost. Prerequisite: Agricultural Economics 100 or Economics 101. Three hours credit without home farm problem or 4 hours credit with home farm problem. 3 or 4 hours.
223. **Farm Business Accounting and Organization.** The legal structure of farm business organizations, including individual proprietorships, partnerships, corporations, and land trusts; accounting principles and methods as applied to farm businesses; financial and management analysis from accounting records; and accounting systems commercially available to farm businesses. Prerequisite: Accountancy 101 or 201; Agricultural Economics 203 and 220. 2 hours.
230. **Marketing of Agricultural Products.** Examines factors affecting the size of the market for agricultural products and the scope of marketing activities; functions and services performed; pricing agricultural products, including the nature and causes of price fluctuations; and costs of marketing and efforts to reduce costs and improve the marketing system. Prerequisite: Agricultural Economics 100 or Economics 101. 3 hours.
235. **Agricultural Cooperative Organization and Management.** Theory of cooperation; growth and distinguishing organizational characteristics of agricultural cooperatives; control and management of cooperatives with emphasis on financial and other management problems; and legal aspects of cooperatives. See Timetable for approximate cost of field trips. Prerequisite: Agricultural Economics 100 or Economics 101. 2 hours.
250. **Agricultural Economics Internship.** A supervised, off-campus experience in a field directly pertaining to a subject matter in agricultural economics; typically the intership is with an agriculturally-oriented firm or governmental agency. Prerequisite: Junior standing, cumulative grade point average of 3.4 or above at the time the intership is arranged, and consent of instructor. 1 to 4 hours.
261. **Agricultural Economic Statistics.** Statistical methods applied to agricultural economics, including graphic presentation, frequency distributions, index numbers, statistical inference, hypothesis testing, sampling, survey design, simple analysis of variance, basic linear regression, and correlation. Prerequisite: Mathematics 124. 3 hours.
301. **Economics of Agricultural Development.** The economics of agricultural development and the relationships between agriculture and other sectors of the economy in developing nations; agricultural productivity and levels of living in the less developed areas of the world; and studies of agricultural development in different world regions including Africa, Asia, and Latin America. Prerequisite: Economics 101 or equivalent. 3 hours, or 3/4 or 1 unit.
302. **Agricultural Finance.** Introduction to agricultural finance including study of financial markets and institutions providing debt and equity capital to agricultural firms, development of skills in applying principles and methods of financial management to agricultural firms. Prerequisite: Agricultural Economics 220 or Accountancy 101, or equivalent. 3 hours or 3/4 unit.
303. **Agricultural Law.** Relation of common-law principles and statutory law to land tenure, farm tenancy, farm labor, farm management, taxation, and other problems involving agriculture. Prerequisite: Senior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
304. **Intermediate Agricultural Finance.** Examines finance principles applied to commercial agriculture at an intermediate level; farm financial and investment

analysis, risk and liquidity analysis, capital structure and leasing in agriculture; and organization, structure, and analysis of rural financial markets and institutions. Prerequisite: Agricultural Economics 302 and 261, or equivalent. 3 hours or 3/4 unit.

305. **Agricultural Policies and Programs.** The problems of agriculture as an industry; analysis of past and current federal and state governmental policies and programs affecting agriculture; objectives and development of policies; the use of economic concepts in evaluating possible future agricultural policies and programs; and forces in policy formation. Field trip; see Timetable for approximate cost. Prerequisite: Economics 101. 3 hours, or 3/4 or 1 unit.
312. **Rural Real Estate Appraisal.** Same as Soils 312. Valuation methods and value bases of rural real estate; legal aspects of property rights, appraisal theory and procedures, condemnation appraisal, characteristics of the rural land market, soil identification and productivity, and other legal, economic, agronomic, and engineering aspects of real estate valuation. Laboratory field trips, including a practice appraisal; see Timetable for approximate cost. Prerequisite: Soils 101 and Agricultural Economics 220, or equivalent. 3 hours, or 3/4 or 1 unit.
318. **Land Economics.** Physical, economic, and institutional factors that affect the role of land in economic life; population and resource requirements; principles of land utilization; returns from land; land value; property rights and tenure rights; social controls; and rural and urban land development. Prerequisite: For undergraduates, Economics 101 or equivalent; for graduates, consent of instructor. 3 hours, or 3/4 or 1 unit.
324. **Decision Making for Farm Operators.** Analyzes decision procedures for common farm operation problems, decision making under uncertainty, control procedures for the farm firm, evaluation of farm investments, and labor management. Prerequisite: Agricultural Economics 220; credit or concurrent registration in Agricultural Economics 302. 3 hours, or 3/4 or 1 unit.
325. **Advanced Farm Management.** Examines the functions of management, effects of goals and values on management decisions, use of economic analysis in farm production planning including resource allocation and valuation, and cost minimization. Prerequisite: Agricultural Economics 220. 3 hours or 3/4 unit.
326. **Professional Farm Management.** Examines principles of farm management applied to problems of those managing farms for others as a profession; business practices and procedures; professional ethics; relationships with clients and farm operators; division of inputs and returns between owner and operator; and direct operation of farms with hired labor. Case studies and field trips; see Timetable for approximate cost. Prerequisite: Credit or concurrent registration in Agricultural Economics 324 or 325. 3 hours or 3/4 or 1 unit.
331. **Grain Marketing.** Economic and marketing problems in grain; the utilization of grain; pricing arrangements for grain, especially futures markets; inventory management; operational problems at country and interior points; factors affecting grain prices; and seasonal variation in grain prices. Field trips required; see Timetable for approximate cost. Prerequisite: Agricultural Economics 230 or an elementary marketing course. 3 hours, or 3/4 or 1 unit.
332. **Livestock Marketing.** Same as Animal Science 332. Economic principles applied to marketing livestock and livestock products from the standpoint of producers, processors, and distributors; theoretical basis for evaluating alternative marketing systems and functions; and evaluation of changes in the industry affecting marketing decisions. Field trip; see Timetable for approximate cost. Prerequisite: Economics 101; Agricultural Economics 230 or an elementary marketing course. 3 hours, or 3/4 or 1 unit.
335. **Economics of Food Distribution.** Same as Horticulture 335. Analysis of (a) marketing structure and operation in the manufacture and wholesale and retail distribution of food; (b) effects of industry organization and government regulations on marketing functions and efficiency; and (c) consumer demand for food.

Prerequisite: Economics 101; Agricultural Economics 230 or an elementary marketing course. 3 hours, or 3/4 or 1 unit.

337. **Economic History of American Agriculture.** Same as Economics and History 337. The development of American agriculture from early colonial times to the present; emphasis on regional development, evolution of methods and equipment, trends in marketing and credit, and the making of federal farm policy. Prerequisite: A college-level course in basic economics or American history. 3 hours, or 3/4 or 1 unit.
338. **Agribusiness Management.** Fundamentals in demand analysis, forecasting, budgeting, investing, locating facilities, financing, pricing, and merchandising in agricultural businesses; practice in decision making using computer games and case problems of firms. Prerequisite: Accountancy 101 or 201; Economics 101 or equivalent. 3 hours or 3/4 unit.
340. **Commodity Futures Markets and Trading.** Development of futures trading; operation and governance of commodity exchanges; economic functions of futures trading; operational procedures and problems in using futures markets; public regulation of futures trading; and developmental problems. Field trips required; see Timetable for approximate cost. Prerequisite: Economics 101 or equivalent. 3 hours or 3/4 unit.
342. **Agricultural Prices.** A study of the factors affecting prices of agricultural products; longtime cyclical, seasonal, and other price movements; sources of information relating to production and demand factors; government activities as they relate to prices of agricultural products; and problems in price analysis and forecasting. Prerequisite: Economics 101 or equivalent. 3 hours, or 3/4 or 1 unit.
352. **Economic Development in Latin America.** Same as Economics 352. See Economics 352.
353. **Economic Development in India and Southeast Asia.** Same as Economics 353. Analysis of plans and progress toward economic development in India and southeast Asia; economic characteristics of the area and their significance for economic development. Prerequisite: Economics 101 or consent of instructor. 3 hours, or 1/2 or 1 unit.
354. **Economic Development of Tropical Africa.** Same as Economics 354. Types of African economies and growth of the exchange economy; development of natural resources, industry, trade, finance, and education; analysis of economic integration, governmental planning, and development projects; and demographic, land tenure, and institutional influences on development. Prerequisite: Economics 101 or consent of instructor. 3 hours, or 1/2 or 1 unit.
361. **Agricultural Surveys and Statistical Analysis.** Reviews methods of survey statistics used with agricultural producers and others in agriculture; studies survey instruments, interviewing, coding, sample design, sampling, survey statistics, and tests of significance; and includes a class problem survey conducted by students. Field trip to the Illinois Crop Reporting Service; see Timetable for approximate cost. 8 week course. Prerequisite: Agricultural Economics 261. 2 hours or 1/2 unit.
362. **Applications of Regression Models in Agricultural Economics.** Emphasizes the application of single equation regression methods to problems in agricultural economics; techniques include ordinary least squares, maximum likelihood estimators, estimators with heteroskedastic, serially correlated, and multicollinear data; and uses of binary independent variables. 8 week course. Prerequisite: Agricultural Economics 261 and Mathematics 134, or equivalent. 2 hours or 1/2 unit.
363. **Optimization Methods in Agricultural Economics.** Application of mathematical programming methods to discrete models in agricultural economics; Kuhn-Tucker theorem, Lagrange multipliers, duality, simplex method as applied to linear and quadratic programming, and input-output analysis models in agriculture. 8 week course. Prerequisite: Mathematics 124 and 134. 2 hours or 1/2 unit.
370. **Family Economics.** Same as Economics 346 and Family and Consumer Economics 370. See Family and Consumer Economics 370.

401. **International Comparative Agriculture.** Agricultural and food problems of the world and of selected countries viewed in the world setting; resources and institutional factors affecting production; and national and international policies and plans for developing agricultural production and improving levels of living. Emphasis is given to a comparative approach to agricultural development of countries on different economic levels. 1 unit.
402. **Agricultural Finance.** Financial planning applied to farms and farm-related firms and sectors; financial aspects of risks and risk management in the food production/distribution system and related financial markets; and cash flow, capital budgeting, and liquidity management. Prerequisite: Agricultural Economics 302 or consent of instructor. 1 unit.
403. **Macro Agricultural Finance.** Analyzes farm sector financial statements, demand and supply of physical and financial assets and liabilities, effects of monetary and fiscal policies on agriculture, and effects of the structure of financial institutions on agriculture. Offered every other year. Prerequisite: Agricultural Economics 302 and 362, or equivalent. 1/2 unit.
405. **Economic Policies and Programs Affecting Agriculture.** Economic analysis of state, national, and international policies and programs, including proposed legislation having important bearing on the well-being of farm people. Prerequisite: One semester of graduate work or consent of instructor. 1 unit.
406. **Research Methodology in Agricultural Economics.** The use of theory and observations in the formulation and resolution of research problems in agricultural economics, including criteria for choice in modeling options and observational methods. 8 week course. Prerequisite: Economics 300 or 301, or equivalent and Agricultural Economics 362. 1/2 unit.
425. **Microeconomics of Agricultural Production.** Examines analysis of agricultural production at the enterprise or farm level; theory, estimation, and utilization of response analysis in agricultural production; estimation of firm production functions; evaluation of firm costs and size economies in agriculture; optimal replacement of durable assets; and theory of leasing and utilization of optimization techniques in firm level analysis. Prerequisite: Economics 300, and an introductory knowledge of multiple regression and linear programming. 1 unit.
426. **Macroeconomics of Agricultural Production.** Evaluation of efficiency in the use of agricultural resources at aggregative level; supply response analysis; evaluation of technological change in agriculture; concepts of productivity and capacity of agriculture and their application; externalities resulting from agricultural production; and research approaches to production analysis. Prerequisite: Economics 300 and 301, and an introductory knowledge of multiple regression and linear programming. 1 unit.
436. **Problems in Marketing Agricultural Products.** Examines selected economic problems in marketing agricultural products and discusses relevant theory and empirical methodologies for analyzing and interpreting research results; topics include: operational efficiency in marketing firms and industries; efficient allocation over space, form, and time; price making institutions; and research in demand stimulation and selected issues in trade. Prerequisite: Agricultural Economics 362 and 363, and Economics 400; or equivalent. 1 unit.
437. **Public Issues in Food Marketing.** Analyzes structure and economic behavior in food processing and distribution, including consideration of marketing costs, competition, food safety, consumer protection, and public regulation of the food industries. Prerequisite: Economics 400 or equivalent. 1 unit.
442. **Agricultural Price Analysis.** Studies the methods used to analyze factors affecting agricultural prices; analyzes agricultural prices and price movements with respect to time, space, and form; and examines methods of price forecasting and techniques of time series analysis. Prerequisite: Agricultural Economics 362 or Economics 471, and Economics 400; or equivalent. 1 unit.
461. **Multivariate Techniques in Agricultural Economics.** Basic theory and use of simultaneous systems of equations in agricultural economics, including identification,

multipliers, and estimators; principal components, factor analysis, and models with limited dependent variables as these techniques apply to agricultural economics research. 8 week course. Prerequisite: Agricultural Economics 362 or equivalent. 1/2 unit.

- 463. **Natural Resource Economics.** Same as Economics, Environmental Studies, and Forestry 463. Emphasizes the role of public policy in natural resource use; theory of allocating renewable and non-renewable natural resources over time; effects of institutions on resource use; causes and consequences of technological change; natural resources and economic growth; and applications of concepts to current natural resource issues. Prerequisite: Economics 300 or equivalent. 1 unit.
- 464. **Environmental Economics: Theory and Applications.** Same as Economics and Environmental Studies 464. See Economics 464.
- 470. **Seminar in Family and Consumption Economics.** Same as Family and Consumer Economics 470. See Family and Consumer Economics 470.
- 491. **Seminar and Special Topics.** All graduate students majoring in agricultural economics must register in the noncredit section of this course. In addition, students may register for credit for individual research or group instruction on special topics under the supervision of one or more staff members. 0 to 2 units.
- 499. **Thesis Research.** Individual research under supervision of members of the graduate teaching staff in their respective fields. 0 to 4 units

Rural Sociology

- 199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 270. **Population Issues.** Same as Sociology 270. See Sociology 270.
- 277. **Rural Social Change.** Same as Sociology 277. Social forces retarding or accelerating change (traditions, beliefs, attitudes, innovations, social movements, and social planning) as related to rural social organizations and institutions. Field trip to be arranged; for costs see Timetable. Prerequisite: Sociology 100. 3 hours.
- 343. **Social Change in Developing Areas.** Same as Sociology 343. Description and analysis of recent social and cultural changes occurring in new nations and developing economies; special attention given to problems of traditional social structure undergoing modernization; and social factors in economic growth, caste and class, nation-building, urbanization and population composition, education, family, and religion. Prerequisite: Sociology 100 or equivalent. 3 hours, or 1/2 or 1 unit.
- 378. **Sociocultural Factors in African Economic Development.** Same as Anthropology 378. See Anthropology 378.
- 407. **Techniques in Demographic Analysis.** Same as Sociology 407. See Sociology 407.
- 477. **Seminar on Community Organization.** Same as Sociology 477. See Sociology 477.
- 487. **Special Problems in Rural Sociology.** Same as Sociology 487. Prerequisite: One unit of graduate credit in sociology; consent of instructor. 1/2 or 1 unit

AGRICULTURAL ENGINEERING

(Including Agricultural Mechanization)

Head of Department: Professor R. R. Yoerger

Department Office: 241 Agricultural Engineering Building, 1208 West Peabody, Urbana

Agricultural Engineering

- 126. **Engineering in Agriculture.** The role of the agricultural engineer in the development of agricultural production facilities; includes resources for production,

- design loads, material and equipment performance characteristics, and crop and livestock production facilities. Prerequisite: Credit or concurrent registration in Mathematics 120. 4 hours.
127. **Production Systems in Agriculture.** Mathematical models of equipment performance; analysis of operational, power, weather, and economic constraints; and elementary design of equipment systems using concepts of probability and optimization. Prerequisite: Agricultural Engineering 126 and credit or concurrent registration in Computer Science 101. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
236. **Machine Characteristics and Mechanisms.** Design and development concepts of agricultural and industrial machines; includes analysis and synthesis of tillage, planting, harvesting, and material handling mechanisms. Prerequisite: Agricultural Engineering 127 and Theoretical and Applied Mechanics 212. 3 hours.
256. **Surveying Agricultural and Forest Lands.** Same as Forestry 256. Basic surveying procedures as applied to practices in soil and water conservation engineering, forest management, and forest engineering; lecture and laboratory. Prerequisite: Mathematics 114 and sophomore standing. 3 hours.
277. **Design of Agricultural Structures.** Design of timber, concrete, and steel agricultural structures; engineering properties of wood, concrete, and steel materials; design of compression members, tension members, and beams and connections; and complete design of a few structural frames. Includes laboratory. Prerequisite: Credit or concurrent registration in Civil Engineering 261. 3 hours.
287. **Environmental Control for Plants and Animals.** Application of engineering and biological principles to the art and science of controlling environments for productive animals, plants, and their products. Methods for maintaining environments to meet specific biological requirements are investigated through the integration of engineering principles for environmental control with the thermodynamic properties of animals, plants, and their related biological needs. Prerequisite: Agricultural Engineering 127. 3 hours.
296. **Honors Project.** A special problem in engineering is selected for bibliographical, theoretical, and/or experimental research. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
298. **Undergraduate Seminar.** Professional engineering concepts; relationship of agricultural engineering to other engineering and agricultural disciplines; and preparation and presentation of an undergraduate thesis proposal. Thesis to be completed in Agricultural Engineering 299. Two-day field trip; see Timetable for approximate cost. Prerequisite: Junior standing in engineering. 1 hour.
299. **Undergraduate Thesis.** The agricultural engineering problem selected in Agricultural Engineering 298 is investigated and a detailed engineering report is prepared. Prerequisite: Agricultural Engineering 298; senior standing in engineering. 2 to 4 hours.
311. **Instrumentation and Measurements.** Same as Mechanical Engineering 311. Accuracy, precision, and statistical consideration of measurement data; dynamics of measurement; displacement, velocity, acceleration, force, torque, pressure, and temperature measurements; mechanical impedance; measurements on fluids; and instrumentation systems. Prerequisite: Senior standing in engineering or science. 3 or 4 hours, or 3/4 or 1 unit.
336. **Design of Agricultural Machinery.** Emphasizes design projects which utilize the principles of machine design, engineering analysis, and functional operation of machinery systems; projects are selected, concepts visualized and tested, and design layouts made; and emphasizes unique aspects of agricultural machinery design in selection of drive trains and material conveyors and in weldment design. Prerequisite: Agricultural Engineering 236; credit or concurrent registration in Mechanical Engineering 270. 3 hours or 3/4 unit.
340. **Introduction to Applied Statistics.** Same as Agronomy, Animal Science, Dairy Science, Food Science, Forestry, and Horticulture 340. See Agronomy 340.

- 346. Tractors and Prime Movers.** Examines engineering aspects of design and application of tractors for farm and construction use; thermodynamics of engines; measurement of power and efficiencies; power transmission and traction; and operator environment. Prerequisite: Mechanical Engineering 209 or equivalent. 3 hours or 3/4 unit.
- 356. Soil and Water Conservation Structures.** Hydrology, hydraulics, design, construction, and cost estimation of structures for the conservation and quality control of soil and water; relationship of topography, soils, crops, climate, and cultural practices in the conservation and quality control of soil and water for agriculture. Prerequisite: Credit or concurrent registration in Theoretical and Applied Mechanics 235. 3 hours, or 3/4 or 1 unit.
- 357. Land Drainage.** Design, construction, performance, and maintenance of surface, subsurface, and open ditch agricultural drainage systems. Prerequisite: Credit or concurrent registration in Theoretical and Applied Mechanics 235. 3 hours, or 3/4 or 1 unit.
- 387. Agricultural Process Engineering.** Principles, design factors, equipment, and controls of systems for drying, refrigerating, reducing, pelleting, blending, cleaning, sorting, and treating agricultural crops and products. Prerequisite: Senior standing in engineering or consent of instructor. 3 hours or 3/4 unit.
- 396. Special Problems.** Individual investigation and report of any phase of agricultural engineering approved by the department. Prerequisite: Senior standing in engineering. 1 to 4 hours, or 1/4 to 1 unit.
- 400. Research Orientation.** Discussion of the philosophy and methods of research, thesis preparation, and publication of research findings. 0 credit.
- 436. Dynamics of Farm Machine Elements.** Advanced study of the dynamics of farm machine elements with specific reference to functional operation, stresses, and fatigue life. Prerequisite: Agricultural Engineering 236 and 336, or equivalent. 1 unit.
- 446. Dynamics of Tillage, Traction, and Earthmoving.** Relationship of soil parameters to forces acting on tillage tools, earthmoving components, and traction devices; stress-strain relationships in soil, failure patterns, and pulverization; and speed effects, energy requirements, power trains, and model simulation. Prerequisite: Bachelor of Science degree in engineering or consent of instructor. 1 unit.
- 490. Seminar.** Presentation and discussion of current research and literature in agricultural engineering. 1/4 unit.
- 496. Problems in Agricultural Engineering.** Investigation and report on problems in farm machinery, farm power, rural electrification, soil and water control, rural housing, and farm structures. Prerequisite: Consent of head of department. 1 unit.
- 499. Thesis Research.** 0 to 4 units

Agricultural Mechanization

- 100. Engineering Applications in Agriculture.** Examples, problems, discussions, and laboratory exercises pointing to present and potential engineering applications in agriculture; emphasis on farm power and machinery, soil and water control, farm electrification, and farm structures. Prerequisite: Mathematics 104, 111, or 112, or equivalent. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Agricultural Mechanics Shop: Construction Technology.** Selection, use, and maintenance of hand and power tools; shop safety; selection of building and roofing materials; concrete masonry construction; and farm surveying. Includes laboratory. Priority is given to students in agricultural occupations and agricultural mechanization majors. Prerequisite: Junior standing and consent of instructor. 3 hours.
- 201. Agricultural Mechanics Shop: Electrical and Metal Work.** Selection and application of electrical wiring materials; principles of operation and application of electric motors and controls to agricultural heating, ventilating, and materials

- handling problems; and selection and use of shielded metal-arc, metallic inert gas, tungsten inert gas, submerged arc, and acetylene welding for agricultural construction and repair. Includes laboratory. Priority is given to students in agricultural occupations and agricultural mechanization majors. Prerequisite: Junior standing and consent of instructor. 3 hours.
221. **Farm Power and Machinery Management.** Performance, costs, application, selection, and replacement of farm tractors and field implements; optimization of mechanized agricultural field operations; and laboratory. Prerequisite: Agricultural Mechanization 100. 4 hours.
241. **Farm Tractor Power.** Construction and performance of internal combustion engines; power transmission, control, fuel, electrical, and hydraulic systems; and analysis of methods and equipment for performance testing. Prerequisite: Physics 101 recommended. 3 hours.
250. **Agricultural Mechanization Internship.** Supervised off-campus learning experience with a business firm engaged in production or technological service to agriculture. Prerequisite: Junior standing with a 3.0 cumulative grade point average; Agricultural Mechanization 221, 252, 272, or 281; and consent of the coordinator of program. 2 hours.
252. **Mechanics of Soil and Water Conservation.** Principles of planning, constructing, and adapting soil conservation and drainage practices for Illinois farms, and the application of surveying to these practices. Lectures, field work, and laboratory. Prerequisite: Agricultural Mechanization 100 or 200. 3 hours.
272. **Farm Buildings.** Requirements of farm buildings; problem analysis and planning; building plans; materials; construction methods; and costs. Lectures, discussions, and laboratory. Prerequisite: Agricultural Mechanization 100 or 200. 3 hours.
281. **Farmstead Mechanization.** Fundamental electric laws; planning electric wiring systems; single-phase motor selection, care, and application; and an introductory study of principles and planning required for materials-handling systems, drying, water pumps and systems, and lighting and ventilation in agricultural production. Prerequisite: Agricultural Mechanization 100 or 201. 3 hours.
299. **Agricultural Mechanization Seminar.** The role of the mechanization of agriculture in society and the part of the individual graduate in this role; directed toward the study of the interplay of developments in agriculture and agricultural mechanization; topics selected from technical and popular journals. A tour of farms, industry, and business is required; see Timetable for approximate cost. Prerequisite: Junior standing. 1 hour.
300. **Special Problems.** A technical agricultural problem is selected for study, investigation, and report, wherein a satisfactory solution does not require a background of engineering education. Prerequisite: Minimum grade point average of 3.5; consent of instructor. 1 to 4 hours, or 1/4 to 1 unit.
331. **Farm Machinery Technology.** The role of forces, motions, and strengths in the operation and performance of common farm machinery mechanisms; study of mechanism illustrations, machinery testing, service problems, and other aspects of the equipment distribution industry. Prerequisite: Physics 101 recommended. 4 hours or 1 unit.
333. **Agricultural Chemical Application Systems.** Hydraulic principles; liquid application systems including pumps, controls, and agricultural spray nozzles; granular application systems; safe storage, handling, and disposal of pesticides and fertilizers; and federal and state legal requirements. Includes laboratory. Prerequisite: Agricultural Mechanization 221, or Agronomy 326, or Horticulture 242 or 262, or Plant Pathology 305 or 377, or Entomology 319 or 322. 3 hours or 3/4 unit.
361. **Development and Function of Family Housing.** Same as Family and Consumer Economics and Interior Design 361. Study of principles and problem solutions in family housing; basic functions, plan patterns, types, materials, and structure; economic influences, costs, and adaptations; and personal and public interests.

Prerequisite: Interior Design 160 or consent of department (agricultural mechanization students, no prerequisite). 3 hours or 3/4 unit.

372. **Livestock Waste Management.** Principles and practices of managing wastes from livestock production facilities; includes collection, storage, transport, runoff control, odor control, aerobic and anaerobic treatment, utilization as crop nutrients, animal nutrients, and fuels, and regulations. Prerequisite: Junior standing and one 200-level animal production course. 3 hours or 3/4 unit.
381. **Electromechanical Agricultural Systems.** Application of electric power and mechanical equipment to livestock production, crop conditioning, and materials-handling systems for efficient use of time, power, and labor; principles of planning materials-handling systems; requirements for environmental control in agricultural production; electric controls circuits; and factors affecting drying, cooling, and processing of crops. Prerequisite: Agricultural Mechanization 281 or graduate standing in agriculture. 3 hours or 3/4 unit

AGRICULTURE

Program Administrator: Dean J. R. Campbell

Program Office: 104 Mumford Hall, 1301 West Gregory Avenue, Urbana

100. **Agriculture in Modern Society.** Analysis of agriculture in contemporary society and introduction to problems and challenges related to agriculture; includes a brief orientation to the University and the College of Agriculture. Required of all freshmen in agriculture. 1 hour.
268. **Cooperative Extension.** Same as Human Resources and Family Studies 268. Introduction to the organization, philosophy, financing, personnel, clientele, and programs of cooperative extension. Prerequisite: A course in the principles of psychology or sociology or consent of instructor. 3 hours.
269. **Cooperative Extension: Summer Experience.** Same as Human Resources and Family Studies 269. Field experience to provide opportunity for students to become acquainted with the roles of county personnel, office organization, and programs in cooperative extension. A living allowance is paid to students during the course. Prerequisite: Agriculture 268 or consent of instructor. 4 hours. Offered in the summer session only.
299. **Agriculture Study Abroad.** Provides campus credit for foreign study and/or travel. A student's proposal for study abroad must have prior approval of the major department and the College of Agriculture. Final determination of credit granted is made upon the student's successful completion of work. Prerequisite: Consent of major department and college. 0 to 15 hours (summer session, 0 to 8 hours). May be repeated to a maximum of 36 hours. Credit for foreign travel, when not accompanied by enrollment in courses in foreign institutions, is limited to 6 hours and only given for participation in a travel program associated with a College of Agriculture or Home Economics approved program.
350. **Education for Rural Development in Low Income Countries.** Same as Vocational and Technical Education 350. See Vocational and Technical Education 350.
369. **Educational Programs in Cooperative Extension.** Same as Human Resources and Family Studies 369. The design and development of informal educational programs for youth and adults in an out-of-school setting. Prerequisite: Agriculture 268 or consent of instructor. 3 hours or 1 unit

AGRONOMY

(Including Agronomy and Soils)

Head of Department:

Department Office: W-201 Turner Hall, 1102 S. Goodwin, Urbana

110. **Plant and Animal Genetics.** Same as Animal Science, Dairy Science, and Horticulture 110. The principles of heredity in relation to plant and animal improvement. Prerequisite: Biology 110 and 111, or Botany 100. 3 hours.
121. **Principles of Field Crop Science.** An introductory course; kinds, origin, taxonomy, morphology, and physiological and ecological bases of growth, reproduction, improvement, and utilization of corn, soybeans, small grains, forage crops, and sorghums; cropping and tillage practices and principles; and field-crop production hazards. 4 hours.
190. **Field-Crop Scouting.** Workshop on the scouting of field crops for major pests and physiological problems; identification of major weeds, diseases, and insects of field crops. Lecture and lab. Offered during spring break. 1 hour.
290. **Undergraduate Agronomy Seminar.** The course includes reports and discussions of crops and soils research. Prerequisite: Senior standing. 1 hour.
299. **Undergraduate Thesis.** Individual research problems in agronomy under the direction of a faculty member in agronomy. Normally the student enrolls during the summer between the junior and senior years and during the fall semester of the senior year, or during both semesters of the senior year. Recommended for those who plan to do research and/or graduate study. Thesis problems should be discussed with the supervising faculty member in the semester preceding enrollment and must be approved by the Agronomy Undergraduate Thesis Committee before enrollment. A maximum of 5 hours may be counted toward graduation. An approved thesis must be presented for credit to be given. Prerequisite: Junior standing; minimum grade-point average of 4.0; consent of instructor. 2 to 5 hours.
300. **Advanced Special Problems.** Individual problems in crops or soils. Graduate students majoring in agronomy do not receive graduate credit. Prerequisite: Minimum grade-point average of 3.5; not open to students on probation; consent of instructor. Approval of the agronomy teaching coordinator is required prior to advance enrollment and registration. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department subject to approval of the instructor. 1 to 5 hours, or 1/2 to 2 units.
318. **Crop Growth and Production.** Crop production and management as influenced by environment, plant species, and cropping system; relates plant growth processes to management practices. Prerequisite: Soils 101 and Agronomy 121 or equivalent, or consent of instructor. 3 hours or 3/4 unit.
319. **Environment and Plant Ecosystems.** Same as Environmental Studies and Forestry 319. Man's role in environmental regulation and how it affects crop productivity through altered cellular and organismal processes; discussion of physiological processes involved in managed plant ecosystems of the community, organismal, and molecular levels. Prerequisite: One course in biology, Chemistry 101 or equivalent, or consent of instructor. 3 hours or 3/4 unit.
320. **Crop Physiology.** The physiological basis of crop plants; how the physiological processes influence potential crop yield and crop production. Prerequisite: Botany 100 or equivalent; one course in organic chemistry or equivalent, or consent of instructor. 3 hours or 3/4 unit.
322. **Forage Crops and Pastures.** Forages, their plant characteristics, ecology, and production; grasslands of farm and range as related to animal production and soil conservation. Prerequisite: Agronomy 121. 3 hours or 3/4 unit.
323. **Principles of Plant Breeding.** Same as Horticulture 323. Genetic and cytological variation in crop plants; the production and control of such variation in developing

- varieties and hybrids; and the maintenance of high quality seed stocks. Field trips; see Timetable for approximate cost. Prerequisite: Botany 100; Agronomy 110 or equivalent. 4 hours or 1 unit.
326. **Weeds and Their Control.** Weeds, their introduction, methods of dissemination, reproduction, and control; a characterization of the common weeds of the Midwest. Prerequisite: Agronomy 121. 3 hours or 3/4 unit.
333. **Plant Physiology Laboratory.** Same as Botany 333 and Horticulture 333. See Botany 333.
336. **Perennial Grass Ecosystems.** Same as Horticulture 336. See Horticulture 336.
340. **Introduction to Applied Statistics.** Same as Agricultural Engineering, Animal Science, Dairy Science, Food Science, Forestry, and Horticulture 340. Statistical methods involving relationships between populations and samples; collection, organization, and analysis of data; and techniques in testing hypotheses with an introduction to regression, correlation, and analyses of variance limited to the completely randomized design and the randomized complete-block design. Prerequisite: Mathematics 104, 111, or 112, or equivalent. 4 hours or 3/4 unit.
350. **Crops and Man.** Interpretations of the role of crop plants in the development of cultures and civilizations; description of crops primarily in terms of their origins, evolution, and influences on man's technology, art, religion, and social and political institutions. Field trip; see Timetable for approximate cost. 3 hours or 3/4 unit.
377. **Diseases of Field Crops.** Same as Plant Pathology 377. See Plant Pathology 377.
400. **Seminar.** Discussions of current literature in crops and soils. Required of all graduate majors in agronomy. Prerequisite: Graduate standing. 0 credit.
422. **Pasture, Range, and Soil Conservation Research.** Discussion and study of data and literature pertaining to pastures, range, and soil conservation; application of research methods to the evaluation of forage species in the management and utilization of pasture and range and to soil conservation. Prerequisite: Agronomy 121 or 322. 1 unit.
423. **Cytogenetic and Evolutionary Basis of Plant Breeding.** Nature and origin of crop species; genetic and cytogenetic basis for developing special plant materials and the use of such materials in breeding programs; and emphasis on discontinuous variation. Prerequisite: Agronomy 323 or equivalent, or consent of instructor. 1 unit.
424. **Enzymes and Metabolic Pathways of Plants.** Same as Botany and Horticulture 424. Study of uptake, transport, and metabolic utilization of mineral nutrients by plants. The scope of the course is to present the essentiality of various anions and cations in the light of metabolic activity and constituency in functional plant compounds; major emphasis on metabolic activity and function of the elements. Prerequisite: Botany 330 or consent of instructor. 1 unit.
429. **The Evolution of Agricultural Economies.** Same as Anthropology 429 and Geography 429. See Anthropology 429.
431. **Plant Cell Metabolism.** Same as Biology, Forestry, Horticulture, and Plant Pathology 431. See Biology 431.
432. **Plant Cell Energetics.** Same as Biology, Forestry, Horticulture, and Plant Pathology 432. See Biology 432.
433. **Environmental Regulation of Plant Growth.** Same as Biology, Forestry, Horticulture, and Plant Pathology 433. See Biology 433.
434. **Regulation of Plant Development and Reproduction.** Same as Biology, Forestry, Horticulture, and Plant Pathology 434. See Biology 434.
435. **Mineral Nutrition of Plants.** Same as Botany 435. See Botany 435.
440. **Design and Analysis of Biological Experiments.** Statistical methods as tools for research; principles of designing experiments and methods of analysis for various kinds of designs, including factorial experiments, are considered from the viewpoint of when and how to use them. Prerequisite: Agronomy 340 or equivalent. 3/4 unit.
441. **Advanced Design and Analysis of Biological Experiments.** Same as Dairy Science 441. Design and analysis of complex experiments; considers confounded factorials, lattices, and other incomplete block designs in terms of their characteristics, usefulness in biological research, and methods of analysis; and computational aspects

- of both regression and analysis of variance. Offered in alternate years. Prerequisite: Agronomy 440 or equivalent. 3/4 unit.
- 442. Environmental Plant Physiology.** Same as Botany 442. See Botany 442.
- 444. Quantitative Aspects of Plant Breeding.** A study of the theoretical bases for plant breeding procedures with special emphasis on the relationship between type and source of genetic variability, mode of reproduction, and effectiveness of different selection procedures. Prerequisite: Agronomy 323 and 440, or equivalent. 1 unit.
- 445. Biochemical Genetics of Higher Plants.** The biochemical description of genetic phenomena including genetic systems, mutagenesis, selection methods, mutant characterization, evolution, maternal inheritance, ploidy, heterosis, tumors, and tissue culture genetics. Prerequisite: Agronomy 110 and Biochemistry 350, or equivalent. 1 unit.
- 462. Origin of Variation in Plants.** Same as Botany 462. Study of the principles of plant evolution; discussion of theoretical and descriptive aspects of origin of variation, mode of speciation, role of hybridization, natural and artificial selection, and adaptation. Prerequisite: Consent of instructor. 1 unit.
- 493. Advanced Studies in Agronomy.** Directed and supervised detailed study of selected problems or topics. Prerequisite: Consent of instructor. Study may be in any one of the following fields: (a) soil chemistry; (b) soil fertility; (c) soil physics; (d) soil classification and pedology; (e) soil mineralogy; (f) soil microbiology; (g) plant breeding and genetics; (h) plant physiology; (i) weed control; (j) crop morphology; (k) crop production and ecology; or (l) statistical techniques and data processing. 1/4 to 2 units.
- 499. Thesis Research.** 0 to 4 units

SOILS

- 101. Introductory Soils.** The nature and properties of soil including origin, formation, and biological, chemical, and physical aspects. Prerequisite: Chemistry 100 or equivalent. 4 hours.
- 301. Soil Survey with Emphasis on Illinois Soils.** Properties and methods used in distinguishing soils; characteristics and distribution of different soils in Illinois; and the cause of these differences and their influence upon proper soil use and management. Laboratory work includes instruction in mapping soils and the use of soil maps, and field trips to examine representative soils. See Timetable for approximate cost. Prerequisite: Soils 101 or consent of instructor. 3 hours or 3/4 unit.
- 302. Soil Testing Practicum.** Chemical procedures useful in assessing soil/plant relationships for field crops; involves lectures on agronomic principles, field work on sampling, and laboratory time to perform soil tests, interpret the analytical results, and formulate a nutrient management program. Field trip; see Timetable for approximate cost. Prerequisite: Soils 101. 2 or 3 hours, or 1/2 or 3/4 unit. Three hours or 3/4 unit credit requires additional laboratory work and consent of instructor.
- 303. Soil Fertility and Fertilizers.** Factors affecting the supply of available major, secondary, and minor elements in soils and their influence on crop production; evaluating fertilizer and lime needs; and fertilizer manufacture, sources, and application methods. Prerequisite: Soils 101. 3 hours or 3/4 unit.
- 304. Soil Management and Conservation.** Application of principles of soil management to the solution of land-use and conservation problems; influence of soil characteristics on drainage, erosion control, cropping intensity, water management, and land-use planning. Prerequisite: Soils 101. 3 hours or 3/4 unit.
- 305. Biochemical Processes in Soil and Water Environments.** Metabolic processes leading to chemical transformations in soil and water environments; implications for soil fertility and environmental pollution. Prerequisite: Microbiology 100; Chemistry 102. 3 hours or 3/4 unit.

306. **The Dynamics of Soil Development.** The relationship of soils as complex dynamic bodies to various disciplines important to their understanding, such as geology, geomorphology, chemistry, and ecology; discussion of the importance of having an overall model to help in understanding soils; and two field trips to be arranged. Prerequisite: Soils 101, Chemistry 102, or consent of instructor. 3 hours or 3/4 unit.
307. **Soil Chemistry.** Emphasis on the inorganic reactions involved in soil development and plant nutrition in soils; topics discussed include colloid systems, properties of water, ion exchange equilibria, plant nutrient forms, and methods of analyses. Prerequisite: Soils 101; Chemistry 102. 3 hours or 3/4 unit.
308. **The Physics of the Plant Environment.** The physics of transport processes in the soil and aerial environment of plants; exchanges of energy and gases in crop canopies and the retention of flow of water, gases, solutes, and heat in soils. Prerequisite: Physics 101 or 106; one semester of calculus; and Soils 101 or consent of instructor. 4 hours or 1 unit.
311. **Laboratory Methods for Soils Research.** Uses traditional wet chemical and instrumental techniques in the characterization of soil properties; includes atomic absorption spectroscopy, gas chromatography, specific ion electrodes, and other techniques in the study of soils. Lecture and laboratory. Prerequisite: Soils 101 and Chemistry 102. 3 hours or 3/4 unit.
312. **Rural Real Estate Appraisal.** Same as Agricultural Economics 312. See Agricultural Economics 312.
313. **Soil Mineral Analysis.** Specialized analytical procedures for determinations of soil minerals and their properties; mineralogy of soils and relationships to soil genesis and fertility. Prerequisite: Soils 101 or consent of instructor. 4 hours or 1 unit. Offered in alternate years.
402. **The Chemistry of Soil Fertility.** The chemistry of the essential plant nutrients in soils, their reactions, and their quantitative relationship to plant growth. Lectures, discussions, and assigned readings. Prerequisite: Soils 101; Chemistry 122. 1 unit. Offered in alternate years.
403. **Genesis, Morphology, and Classification of Soils.** Historical review of soil genesis and classification; morphology and genesis of diagnostic soil horizons and features; soil genesis processes and reactions; classification of soils; and characteristics, geography, and production potentials of major soil groups of the world. Lectures, discussions, and assigned readings. Prerequisite: Soils 301 or consent of instructor. 1 unit. Offered in alternate years.
405. **Colloidal Chemistry of Soils.** Soil components, their nature, and their influence on the physical, chemical, biological, and electrokinetic properties of soils. Lectures, discussions, and assigned readings. Prerequisite: Chemistry 340 or equivalent. 1 unit. Offered in alternate years.
411. **Soil Physics.** The derivation and application of the fundamental physical principles and laws which govern the behavior of soils; emphasis on transport phenomena and physical characteristics of soils. Lectures, discussions, and assigned readings. Prerequisite: Mathematics 345, Soils 308, or consent of instructor. 1 unit. Offered in alternate years.
412. **Soil Organic Matter.** Basic considerations in organic matter transformation; geochemistry of organic matter; nature and origin of humic substances; and reactions of organic matter in soils and sediments. Lectures, discussions, and assigned readings. Prerequisite: Consent of instructor. 1 unit. Offered in alternate years.
414. **Physical Chemistry of Clays and Soils.** Same as Mining Engineering 414 and Ceramic Engineering 414. The application of physical-chemical principles and concepts to surfaces and adsorption on surfaces; emphasis on silicate surfaces and water adsorption. Prerequisite: Chemistry 245 or 344, or consent of instructor. 1 unit. Offered in alternate years.

AIR FORCE AEROSPACE STUDIES

Head of Department: Colonel R. A. Rung

Department Office: 224 Armory Building, 505 East Armory, Champaign

102. **Leadership Laboratory.** Prerequisite: Concurrent enrollment in any Air Force Aerospace Studies course, or consent of professor of aerospace studies. No credit. May be repeated.
111. **The Air Force Role in National Security.** First-year survey designed to familiarize the student with the organization, mission, and history of the United States Air Force as it relates to the total defense structure; examines the decision-making processes, resources, and functions of United States general-purpose military forces and aerospace support organizations. Prerequisite: Concurrent registration in Air Force Aerospace Studies 102. 1 hour.
112. **The Air Force Role in National Security.** Continuation of Air Force Aerospace Studies 111. Examines the decision-making processes, resources, and functions of United States strategic offensive and defensive forces and USAF aerospace support organizations. Prerequisite: Air Force Aerospace Studies 111 or consent of instructor; and concurrent registration in Air Force Aerospace Studies 102. 1 hour.
121. **Sophomore Theory Course: United States Military Forces in the Contemporary World, I.** A study of the organization of the Department of Defense and the role of the military in national policies. In addition, an analysis of the nature and principles of war is presented. Prerequisite: Air Force Aerospace Studies 112 or consent of instructor; and concurrent registration in Air Force Aerospace Studies 102. 1 hour.
122. **United States Military Forces in the Contemporary World, II.** An examination, from a historical and political-science point of view, of the major events of military activity during the last twenty-five years and their effect on future Air Force officers. Prerequisite: Air Force Aerospace Studies 121 or consent of instructor; and concurrent registration in Air Force Aerospace Studies 102. 1 hour.
231. **Junior Theory Course: The Professional Officer, I.** A study of professionalism, leadership, and management, including the meaning of professionalism and professional responsibilities; communication skills and their employment in the Air Force; leadership theory, functions, and practices; management principles and function; problem solving; and management tools, practices, and controls. Prerequisite: Completion of all freshman and sophomore theory courses or consent of professor of aerospace studies; successful completion of the Air Force Officer Qualification Test and a military physical examination; and concurrent registration in Air Force Aerospace Studies 102. 3 hours.
232. **Junior Theory Course: The Professional Officer, II.** Continuation of Air Force Aerospace Studies 231. Prerequisite: Completion of all freshman and sophomore theory courses or consent of professor of aerospace studies; successful completion of the Air Force Officer Qualification Test and a military physical examination; and concurrent registration in Air Force Aerospace Studies 102. 3 hours.
241. **National Security Forces in Contemporary American Society, I.** In-depth studies of the military justice system, the military profession, civil-military interactions, defense policies, and strategy. Prerequisite: Completion of all freshman, sophomore, and junior theory courses or consent of professor of aerospace studies; successful completion of the Air Force Officer Qualification Test; a military physical examination; and concurrent registration in Air Force Aerospace Studies 102. 3 hours.
242. **National Security Forces in Contemporary American Society, II.** In-depth studies of communication skills as used in the Air Force; includes officer classification and assignment systems, strategy and the management of conflict, formulation and implementation of United States defense policy, and defense organization and policy making. Prerequisite: Air Force Aerospace Studies 241 or consent of instructor; and concurrent registration in Air Force Aerospace Studies 102. 3 hours.

ANATOMICAL SCIENCES

Head of Department: Professor C. R. Leeson

Department Office: 488a Burrill Hall, 407 S. Goodwin, Urbana

- 290. Individual Topics.** Laboratory work and/or reading in fields selected in consultation with an appropriate faculty member. Prerequisite: 15 hours in Life Sciences courses including one course in Anatomical Sciences, or consent of instructor. 2 to 5 hours. May be repeated to a maximum of 6 hours.
- 304. Research Methods.** Problem-oriented laboratories in research techniques in the anatomical sciences. Students select up to six special topics representing different areas of anatomical sciences, such as microscopy (LM and EM), histological and histo-cytochemical techniques, tissue culture, radioautography, immunohistochemistry, and microsurgery. Emphasis placed on ability to work independently. Prerequisite: Consent of instructor. 1/4 unit.
- 319. Vertebrate Histology.** Microscopic anatomy of vertebrates with special reference to man; emphasis on developing an understanding of the structural organization of cells, tissues, and organs, together with functional relationships; and provides morphological approaches for comprehending and investigating biological problems at cellular and subcellular levels. Prerequisite: Biology 111 or 151, or equivalent and consent of instructor. 4 hours or 1 unit.
- 407. Functional Neuroanatomy.** Same as Psychology 407. Examines representative vertebrate and invertebrate nervous systems with primary reference to mammals; provides the student with a structural foundation for understanding and investigating the functions of the nervous system. Prerequisite: Graduate standing or consent of instructor. 4 hours or 1 unit.
- 412. Anatomical Sciences Seminar.** Invited speakers, faculty, and student presentations and discussions on current research topics. Prerequisite: Graduate standing. 1/4 unit. May be repeated to a maximum of 2 units.
- 421. Human Gross Anatomy.** Comprehensive study of the anatomy of the human body, emphasizing principles of structural and functional relationships of musculoskeletal, circulatory, nervous and splanchnic systems, and total dissection of the human cadaver. Prerequisite: Physiology 234 or consent of instructor. 1 unit.
- 490. Individual Topics.** Individual topics in research and/or reading for graduate students, to be conducted under the supervision of faculty members in anatomical sciences; designed to allow students to become more familiar with specialized fields of study prior to committing themselves to a specific area for their graduate degree. Prerequisite: Graduate standing and consent of instructor. 1/4 to 4 units

ANIMAL SCIENCE

Head of Department: Professor D. E. Becker

Department Office: 328 Mumford Hall, 1301 W. Gregory, Urbana

- 100. Introduction to Animal Science.** A survey of cattle, poultry, sheep, swine, horse, and companion animal industries; includes the importance of product technology and the basic principles of nutrition, genetics, and physiology as they apply to breeding, selection, feeding, and management. Lecture and lab. 4 hours.
- 109. Meat Purchasing and Preparation.** A general approach to meat utilization with emphasis on selecting, grading, cutting, and pricing meat for the home, restaurant, and food service industry; includes laboratory. When appropriate, field trips are taken to area commercial establishments; see Timetable for approximate cost. 2 hours. Offered in alternate years.
- 110. Plant and Animal Genetics.** Same as Agronomy, Dairy Science, and Horticulture 110. See Agronomy 110.

119. **Meat Technology.** Student participation in the transformation of live animals through slaughter and carcass fabrication into food products for human consumption; includes laboratory. Purchase of personal equipment and a field trip are required; see Timetable for approximate cost. Prerequisite: Consent of instructor. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Special Problems.** Individual research in animal science. Prerequisite: Minimum grade-point average of 3.5; not open to students on probation; senior standing; consent of instructor and head of department. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department subject to approval of the instructor. 1 to 5 hours.
202. **Domestic Animal Physiology.** A study of the basic physiology of domestic animals in relation to husbandry practices. Prerequisite: Animal Science 100, Dairy Science 100, or one semester of animal biology, or equivalent. 4 hours.
203. **Behavior of Domestic Animals.** Same as Dairy Science and Ecology, Ethology, and Evolution 203. Introduction to concepts of animal behavior with emphasis on domestic animals; lecture and lab. Prerequisite: Biology 104 and Animal Science 100 or Dairy Science 100, or equivalent. 3 hours. Credit is not given for both Animal Science 203 and Ecology, Ethology, and Evolution 346.
206. **Light Horse Management.** The horse industry; anatomy, selection, breed types, gaits, nutrition and feeding, breeding and reproduction, health and disease, tack and equipment, training and showing, and housing of pleasure horses. Prerequisite: Sophomore standing. 3 hours.
207. **Companion Animal Management.** Biological management of companion animals emphasizing the dog and cat as well as others such as the rabbit, the bird, and fish; subject matter includes anatomy, breeds and breed types, selection, nutrition, reproduction, genetics, training, health and disease, equipment needs, and showing of small animals. 3 hours.
209. **Meat Animal and Carcass Evaluation.** Principles and techniques of meat animal and carcass evaluation and their relationship to current practices in industry; includes demonstrations and student participation. Students planning to enroll in Animal Science 210 and 212 should take Animal Science 209 in their sophomore year. Prerequisite: Animal Science 100. 3 hours.
210. **Meat Selection and Classification.** Characteristics associated with the value of carcasses and wholesale cuts from meat animals; grading and classification. Field trips to meat packing plants are required; see Timetable for approximate cost. Prerequisite: Animal Science 209. 2 hours.
211. **Breeding Animal Evaluation.** The application of current scientific tools, methods, and performance programs available to livestock breeders for improving beef cattle, swine, sheep, and horses; emphasis on the changing nature of modern breeds of livestock as influenced by selection, economics, and consumer and market trends. Prerequisite: Sophomore standing and credit or concurrent registration in Animal Science 209. 3 hours.
212. **Advanced Livestock Evaluation.** Advanced instruction in evaluating meat animals for slaughter and selection of breeding animals; laboratory-discussion. Prerequisite: Animal Science 211 or consent of instructor. 3 hours.
221. **Animal Nutrition.** Same as Dairy Science 221. Principles of animal nutrition and their application to farm livestock and man. Credit is not given for both Animal Science 221 and 325. Prerequisite: Chemistry 102 or equivalent. 4 hours.
230. **Comparative Physiology of Reproduction, Lactation, and Growth.** Same as Dairy Science 230. Physiology of domestic and laboratory animals with emphasis on reproduction, lactation, and growth as they influence livestock production. Prerequisite: One course in chemistry. 3 hours.
283. **Beef Cattle and Swine Management.** Examines basic principles of beef cattle and swine management for students other than animal science majors. Prerequisite: Animal Science 100. 3 hours. Credit is not given for both Animal Science 283 and Animal Science 301 or 303.

290. **Introduction to Metabolism in Domestic Animals.** Principles and regulation of metabolism in animals, emphasizing energy derivation and its relationship to domestic animal production. Prerequisite: Chemistry 102 and credit or registration in Animal Science 221. 3 hours.
299. **Seminar.** Individual oral presentations and written reports by senior students in animal science on subjects related to research in the animal sciences. 1 hour.
301. **Beef Production.** The principles of feeding and management of beef cattle; financial aspects of beef production; and diseases, parasites, and breeding difficulties of beef cattle. Lectures, demonstrations, and discussions. Prerequisite: Animal Science 221 or equivalent. 3 hours or 3/4 unit (summer session, 1/2 or 3/4 unit).
302. **Sheep Science.** A study of the sheep as a biological entity and of factors which influence its responses; examination of the industry which utilizes the sheep's productive potential and of the role of sheep and the industry in animal agriculture and world welfare. Students may register for 3 hours credit without laboratory, for 4 hours credit with laboratory, or for 3/4 unit. Prerequisite: Animal Science 221 or equivalent. 3 or 4 hours, or 3/4 unit.
303. **Pork Production.** Applies science and technology to the selection, breeding, feeding, housing and management of swine in a production enterprise; emphasizes use of research findings in decision making. Prerequisite: Agronomy 110; or Animal Science 221, 230 or 307; or Dairy Science 330. 3 hours or 3/4 unit. Credit is not given for both Animal Science 283 and 303.
304. **Poultry Management.** The application of science and technology in solving the breeding, feeding, housing, and various management problems encountered in commercial egg and poultry meat production. Three hours credit without or 4 hours credit with individual study and conference, or 3/4 unit. Prerequisite: Animal Science 221 or 325, or equivalent. 3 or 4 hours, or 3/4 unit.
305. **Genetics and Animal Improvement.** Same as Dairy Science 305. See Dairy Science 305.
307. **Environmental Aspects of Animal Management.** Animal- environmental interactions (including thermal, air, microbic, photic, sound, and behavioral factors) as bases for prescribing practical environments for production of animals. Prerequisite: Animal Science 202. Courses in physiology, nutrition, microbiology, and genetics respectively are recommended. 3 hours or 3/4 unit.
309. **Meat Science.** Fundamental biological principles that influence growth, composition, processing, preservation, and quality of meat and meat products. Prerequisite: Chemistry 102; Microbiology 100 and 101, or 200 and 201. Field trip required; see Timetable for approximate cost. 4 hours or 1 unit.
310. **Genetics of Domestic Animals.** Genetics of domestic animals and genetic mechanisms involved in reproduction, growth, metabolism, behavior, and disease resistance; applications in animal production. Prerequisite: Agronomy 110 and Animal Science 202, or equivalent. 3 hours or 3/4 unit.
314. **Systems Analysis in Animal Science.** Principles and applications of analysis, modeling, simulation, optimization, and evaluation of animal production systems; computer applications focusing on the BASIC language; and introduction of several herd simulators and packages. Prerequisite: Animal Science 301, 302, 303, or 304; Mathematics 161 or Agronomy 340; and Mathematics 120. 4 hours or 1 unit.
320. **Nutrition and Digestive Physiology of Ruminants.** Same as Dairy Science 320. See Dairy Science 320.
323. **Advanced Swine Management.** Applies principles of swine management and pork production, including participation in the operation of a farrow-to-finish pork production unit. Prerequisite: Animal Science 303, senior standing, and consent of instructor. 3 hours or 3/4 unit.
325. **Principles of Animal Nutrition.** Principles of animal nutrition and their application to veterinary practice; designed primarily for students in veterinary medicine. Lecture and laboratory. Credit is not given for both Animal Science 325 and 221. Prerequisite: Biochemistry 350, or equivalent. 3 hours or 3/4 unit.

330. **Reproduction and Artificial Insemination of Farm Animals.** Same as Dairy Science 330. See Dairy Science 330.
332. **Livestock Marketing.** Same as Agricultural Economics 332. See Agricultural Economics 332.
340. **Introduction to Applied Statistics.** Same as Agricultural Engineering, Agronomy, Dairy Science, Food Science, Forestry, and Horticulture 340. See Agronomy 340.
341. **Human Evolution, II.** Same as Anthropology 341. See Anthropology 341.
345. **Statistical Methods.** Same as Dairy Science and Forestry 345.. See Dairy Science 345.
346. **Animal Behavior.** Same as Anthropology and Ecology, Ethology, and Evolution 346. See Ecology, Ethology, and Evolution 346.
347. **Animal Behavior Laboratory.** Same as Anthropology and Ecology, Ethology, and Evolution 347. See Ecology, Ethology, and Evolution 347.
350. **World Animal Agriculture.** Same as Dairy Science 350. Surveys the role of animal agriculture and associated activity in relation to resources and environment in representative geographic and cultural areas of the world; provides orientation for agriculturally oriented study tours such as Agriculture 299 and similar international experiences. Prerequisite: Consent of instructor. 3 hours or 3/4 unit.
360. **Introduction to Biochemical Toxicology.** A biochemical approach to the mechanisms and effects of both natural and synthetic intoxicants affecting the nutrition and performance of domestic animals and man. Prerequisite: Biochemistry 350 or 352, or Animal Science 290. 4 hours or 1 unit.
400. **Animal Science Graduate Seminar.** Discussion of current literature in animal science. Required of all graduate majors in animal science. Sections offered in animal genetics, environmental management, meat science and muscle biology, nonruminant nutrition, reproductive physiology, and ruminant nutrition. 0 or 1/4 unit. May be repeated to a maximum of 1 unit.
401. **Animal Bionomics.** Discussion of the current literature and research techniques pertaining to adaptation of domestic animals to their environments. Prerequisite: Animal Science 307 or consent of instructor. 1/2 unit.
402. **Principles of Sheep and Wool Production.** Basic considerations in sheep and wool production and lamb feeding; reports of research. Prerequisite: Consent of instructor. 1/2 unit.
403. **Techniques in Animal Nutrition Research.** Discusses and applies methods of laboratory analysis and animal experimentation frequently used in nutrition research. Prerequisite: Courses in nutrition, physiology, and biochemistry and consent of instructor. 3/4 unit.
404. **Concepts in Nonruminant Nutrition.** A review of current literature in nonruminant nutrition. Prerequisite: Consent of instructor. 1/2 unit.
406. **Physiology of Reproduction.** Same as Physiology 406. Comparative physiology of reproduction and endocrinology of domestic and laboratory animals; fertility and sterility. 1 unit.
407. **Laboratory Methods in Physiology of Reproduction.** Same as Physiology and Veterinary Biosciences 407. Introduction to and practice in laboratory methods for obtaining tissues, gametes, and embryos; includes assays for hormones, preparation of animals, and experimental surgery for research in reproduction. Prerequisite: Physiology 312 and Agronomy 340 and Animal Science 406 or equivalents; and consent of instructor. 1/2 unit.
409. **Muscle Biology.** Microstructure and chemical composition of muscle tissue; chemistry and biosynthesis of muscle and connective tissue proteins; and biochemical aspects of muscle contraction and rigor mortis. Prerequisite: Biochemistry 350 and 355. 1/2 unit.
410. **Research Methods in Animal Science.** Designed to give students training and experience in research and techniques related to animal nutrition, biological management, environmental physiology, genetics, meat science, muscle biology, nutritional biochemistry, or reproductive physiology. Prerequisite: Consent of instructor. 1/4 to 1 unit. May be repeated to a maximum of 1 unit.

412. **Advanced Endocrinology.** Same as Dairy Science, Physiology, and Veterinary Biosciences 412. See Physiology 412.
415. **Linear and Non-Linear Statistical Models for Biologists.** Same as Dairy Science and Forestry 415. Studies advanced statistical methods: survey sampling; fixed, random, and mixed linear models with unequal numbers; categorical data; non-linear deterministic and stochastic models; growth curves and time series. Examines applications to biology and agriculture. Offered in alternate years. Prerequisite: Mathematics 130 and Dairy Science 345, or equivalent. 1 unit.
416. **Statistical Genetics and Breeding Plans.** Same as Dairy Science 416. Selection theory, including maternal effects, multivariate selection, constrained and nonlinear cases, and retrospective indexes; estimation of genetic parameters from mixed and random models, including the unbalanced case; and applications to economic and laboratory species. Offered in odd-numbered years. Prerequisite: Dairy Science 317, Biology 373, or Agronomy 440; and Mathematics 315 or consent of instructor. 3/4 unit.
420. **Comparative Protein and Energy Nutrition.** Physiological aspects of protein and amino acids, fats and fatty acids, and carbohydrates as applied to higher animals; includes classification, digestion, absorption, utilization, metabolism, and dietary deficiencies and excesses. Prerequisite: Biochemistry 350 or equivalent and a course in nutrition. 3/4 unit.
421. **Minerals and Vitamins in Metabolism.** Nutritional implications and metabolic roles of minerals and vitamins in animal metabolism. Prerequisite: Biochemistry 350 or equivalent and a course in nutrition. 3/4 unit.
463. **Radioisotopes in Biological Research: Principles and Practice.** Same as Biophysics and Veterinary Biosciences 463. See Veterinary Biosciences 463.
481. **Animal Biochemical Laboratory Techniques.** Same as Dairy Science 481. See Dairy Science 481.
499. **Thesis Research.** 0 to 4 units

ANTHROPOLOGY

Head of Department: Professor C. E. Cunningham

Department Office: 109 Davenport Hall, 607 S. Mathews, Urbana

102. **Introduction to Anthropology: The Origin of Man and Culture.** An introduction to and survey of human origins and early man, physical anthropology, race and racism, archaeology, and the beginning of human civilization. Recommended though not required to be taken with Anthropology 103 as a survey of the field of anthropology. Credit is not given for both the Anthropology 102-103 sequence and Anthropology 110. 4 hours.
103. **Introduction to Cultural Anthropology.** Survey of cultural anthropology; deals with the nature of culture and its various aspects including social organization, technology, economics, religion, and language, as these are seen among contemporary primitive or preliterate peoples; and some attention also given to distinctive theoretical approaches and to problems of culture change. Credit is not given for both the Anthropology 102-103 sequence and Anthropology 110. 4 hours.
105. **Introductory World Archaeology.** Using archaeological data, traces our prehistoric heritage and the processes which led to the evolution of agriculture, settled villages, and civilization in many areas of the world; lectures range from Australopithecus to Homo sapiens and from Sumeria and Egypt to Mexico, Peru, and the United States. 3 hours.
110. **General Anthropology.** A concentrated alternative to the Anthropology 102-103 sequence, introducing fundamental concepts in human biology, prehistory, linguistics, and culture and society through a survey of the whole field of general anthropology. Designed to prepare prospective concentrators and other serious

students for more advanced anthropology courses. Credit is not given for both Anthropology 110 and the Anthropology 102-103 sequence. 4 hours.

115. **Other Peoples' Calendars.** Reviews developments in the study of time, emphasizing archaeoastronomy, ethnoastronomy, and the comparative analysis of calendar systems and calendrical rituals. 3 hours.
132. **Culture, Aging, and Maturity.** Comparative study of human maturity, aging, and death as they are given form and meaning in different cultural and social settings. 3 hours.
143. **Biological Bases of Human Behavior.** Same as Ecology, Ethology, and Evolution and Human Development and Family Ecology 143. Critical consideration of data and information bearing on current controversies and ideas concerning the antecedents of selected aspects of human behavior. Topics to be discussed include communication, social organization, and parental, sexual, and aggressive behavior. 3 hours.
161. **Black Folk Culture.** Same as Afro-American Studies 161. A topical introduction to Pan-Africanist thought and ideology as expressed in the folklore, literature, music, and sociocultural movements of Afro-Americans in the New World. 4 hours. May be repeated to a maximum of 8 hours.
165. **North American Indians.** Surveys native American peoples and cultures north of Mexico from the time of European contact to the present, emphasizing contemporary issues and their historical antecedents. 3 hours.
168. **Indian Civilization and Society.** Same as History 168. An introductory survey course on an interdisciplinary basis dealing with the evolution of Indian religion, politics, culture, and social organization. 4 hours.
169. **South Asia in the Modern Period.** Same as History 169. See History 169.
174. **American Communities and Their Problems.** An examination of American society and its cultural heterogeneity through the study of selected communities, community problems, and solution alternatives. 4 hours.
179. **Culture and Ecology in Human Health.** An overview of health and illness in human societies emphasizing interactions among stress, adaptability, and culture. Case studies of differing cultural and ecological settings, past and present, and of differing health care systems are related to alternative theories of health and illness, including contemporary cosmopolitan medicine. 3 hours.
182. **Peoples and Cultures of South America.** South America as a theater of conflict and cultural experimentation among native American, African, and Iberian peoples; their survival and transformation as reported in selected ethnographies and eyewitness sources; and some modern theories and controversies about their experience. Prerequisite: Anthropology 103 or 110, or consent of instructor. 3 hours.
183. **Archaeology and the Public.** An examination of the roles of archaeology in society; topics include public service archaeology, "colonial" and "national" archaeologies, the role of the archaeologist in Euro-American conceptions of the American Indian, and the archaeologist as creator and dispeller of myths. 3 hours.
186. **Southeast Asian Civilizations.** Same as Asian Studies 186. The historical development and interaction of the dominant commercial, political, religious, artistic, and social traditions of the Southeast Asian region. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
210. **Comparative Family Organization.** Same as Human Development and Family Ecology. See Human Development and Family Ecology 210.
220. **Introduction to Prehistory.** An introduction to the problems of studying past cultures; special attention given to the ranges of techniques available and the adequacy of various methodologies as bases for sound inference about the structure of extinct cultures. Prerequisite: Anthropology 102 or 110, or consent of instructor. 3 hours.
222. **Introduction to Modern Africa.** Same as African Studies, Political Science, and Sociology 222. See African Studies 222.
230. **Introduction to Social Anthropology and Ethnology.** An introduction to the anthropological study of contemporary human societies; emphasis on the comparative

study of social organization, interpersonal relations, cultural ecology, and processes of sociocultural change, but also includes some consideration of the method and theory of ethnological field research. Prerequisite: Anthropology 103 or 110, or consent of instructor. 3 hours.

240. **Introduction to Biological Anthropology.** The past and present evolution of man and his populational and individual biological variation; topics include genetic principles relevant to human evolution, primate phylogeny and behavior, fossil evidence for human evolution, and the origin and significance of biological diversity in modern man. Prerequisite: Anthropology 102, 110, or 143; or an introductory life sciences course; or consent of instructor. 3 hours.
244. **Anthropology of Play.** Same as Physical Education 244. See Physical Education 244.
246. **Vertebrate Social Organization.** Same as Ecology, Ethology, and Evolution, Psychology, and Sociology 246. See Ecology, Ethology, and Evolution 246.
250. **Introduction to Primitive Technology.** Introduction to the technology of nonindustrial societies; relationships of technology to society; and influence of social and cultural factors on technological innovation. Ethnographic, historical, and archaeological data are used. 3 hours.
259. **Spanish-Speaking Peoples in the United States.** Introduction to the Spanish-speaking population of the United States, including demography, history, economics, and aspects of the sociocultural milieu; emphasis on Mexican-Americans and Puerto Ricans, although other Spanish-speaking groups are also considered. Prerequisite: Anthropology 103 or 110, or consent of instructor. 3 hours.
260. **Peoples of the World: Introduction to Ethnography.** The study and criticism of ethnographic descriptions of exotic ways of life, both as scientific reporting and as a literary art form. Readings include examples from several major culture areas: Africa, the Americas, the Middle East, Oceania, southern and eastern Asia, and Western civilization. Prerequisite: Anthropology 102, 103, or 110, or consent of instructor. 3 hours.
261. **Afro-American Societies and Cultures.** Same as Afro-American Studies 261. Designed to examine the breadth of the black Americas in South America, Central America, the Caribbean (including Spanish, Gallic, Dutch, and English subareas), and Canada, with specific comparisons to rural and urban United States; the African slave trade with reference to black-white relations in the trade; the development of Creole cultures in West Africa and in Spain and subsequent cultural elaboration in the New World; conditions of slavery, slave revolts, migrations of black people in the New World; and examination of selected ethnographic material. Prerequisite: Anthropology 102, 103, or 110, or consent of instructor. 4 hours.
262. **Cultural Images of Women.** Perceptions of women, their perceptions of themselves, and their varying roles and statuses in several contemporary societies in diverse countries; supervised ethnographic observation of women's behavior. 3 hours.
270. **Introduction to Linguistic Anthropology.** Introduction to linguistic anthropology as a major subdiscipline within the field of anthropology; problems of elicitation and analysis of language as faced by anthropologists; and the role of language in the other major subdisciplines: biological, archaeological, and social anthropology. Prerequisite: Anthropology 103 or 110 or Linguistics 200, or consent of instructor. 3 hours.
280. **Personal Anthropology.** Anthropological approaches and methods related to the student's everyday life situation; explanation and use of ritual, ideology, myth, communication, media images, rites of passage, structure, symbols, and other concepts so that the student may develop a more critical understanding of contemporary American society and his or her position in it. 3 hours.
290. **Individual Study.** Supervised reading and research on anthropological topics chosen by the student with staff approval. Especially (but not exclusively) for students who are preparing for a summer field-work project, or who have some justifiable reason for doing independent study, but who do not qualify for the honors (departmental distinction) courses. May not be taken concurrently with

Anthropology 291 or 293. Prerequisite: Junior or senior standing; 12 hours in anthropology; consent of instructor. 2 to 4 hours.

291. **Honors Individual Study.** Individual study and research projects for those students who are candidates for departmental distinction in anthropology. May not be taken concurrently with Anthropology 290. Prerequisite: Senior standing; 4.2 grade-point average in anthropology; consent of instructor. 2 to 4 hours.
293. **Honors Senior Thesis.** Preparation and completion of a senior honors thesis, research paper, or equivalent project for those students who are candidates for high or highest departmental distinction in anthropology. May not be taken concurrently with Anthropology 290. Prerequisite: Senior standing; 4.2 grade-point average in anthropology; consent of instructor. 2 to 4 hours.
297. **Honors Seminar.** Each seminar considers a topic or issue of current interest in anthropology. Prerequisite: Anthropology 102 and 103 or Anthropology 110, two additional anthropology courses, a grade-point average of 4.25 in anthropology courses, and consent of instructor. 3 hours. May be repeated as topic varies to a maximum of 6 hours.
300. **Introduction to Linguistic Structure.** Same as Linguistics 300. See Linguistics 300.
307. **Introduction to Mathematical Linguistics.** Same as Linguistics 307. See Linguistics 307.
308. **Comparative Primate Anatomy.** Same as Veterinary Biosciences 307. See Veterinary Biosciences 307.
315. **Area Studies in Ethnomusicology.** Same as Music 317. See Music 317.
316. **Anthropology of Music.** Same as Music 316. See Music 316.
317. **Anthropological Study of Verbal Art.** Analysis of several genres of verbal art (for example, riddles, stories, proverbs, nonsense, and oral literatures) from the perspective of contemporary theory, emphasizing cross-cultural data. Prerequisite: Introductory courses in literary criticism, general anthropology, or analysis of literary texts; or consent of instructor. 3 hours or 3/4 or 1 unit.
318. **Anthropological Research Design.** Lecture and laboratory on the application of quantitative and qualitative methods in anthropological research; emphasizes both theoretical and methodological problems in designing field research and analyzing field data. Prerequisite: Anthropology 220, 230, 240, or 260 and a course in statistics; or consent of instructor. 3 hours, or 3/4 or 1 unit.
320. **Political Anthropology.** The analysis of political behavior and the comparison of political systems from an anthropological perspective; emphasis on local level political processes and the evolution of governmental forms. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or 3/4 or 1 unit.
321. **Social Organization and Structure.** An introduction to anthropological concepts of social organization and structure; considers kinship theory, descent and alliance systems, social stratification, nonkin association, social networks, group identification and boundaries, structural-functional interpretations of society, and the meaning of social or cultural structure. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or 3/4 or 1 unit.
322. **Anthropology of Law.** Analyzes the legal systems of several primitive societies, the social context in which such legal systems operate, and the place of such studies in developing a theory of jurisprudence; special attention given to legal changes in the developing nations and to the legal problems of minority populations. Prerequisite: Anthropology 103, 260, or 339, or equivalent. 3 hours, or 3/4 or 1 unit.
324. **Late Cenozoic Geology.** Same as Geology 324. See Geology 324.
328. **North American Archaeology.** Methods, techniques, and results of archaeology in North America; focuses on divergent approaches to the regional archaeology of North America; and surveys and synthesizes the archaeology of the subcontinent. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or 3/4 or 1 unit.
329. **The Philosophy of Social Science.** Same as Philosophy 375 and Sociology 325. See Philosophy 375.

330. **Processes of Culture Change.** The impact of modern cultures on native peoples, comparative study of the mechanisms underlying the transition to modernity in the new nations, and the psychological and structural aspects of acculturation and urbanization. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or 3/4 or 1 unit.
331. **Aboriginal North America.** Deals with three major topics: the nature and structure of aboriginal North America as a cultural province and its ecological base; distinctive and common features of American Indian cultures; and responses to the stresses of white contact. Selected type cultures and their adaptations to varying ecological situations are examined in detail. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or 3/4 or 1 unit.
332. **Indians of Lowland South America.** A survey of aboriginal non-Andean peoples in contemporary settings; historical and geographical bases for cultural adaptation and elaboration; and ethnicity, cultural ecology, social organization, ritual, and change in selected areas of Lowland South America. Prerequisite: Anthropology 230 or 260, or consent of instructor. 3 hours, or 3/4 or 1 unit.
333. **South American Indians of the Andean Region.** A survey of Andean cultures at the time of the Spanish conquest, of their subsequent history, and of modern Indian culture in the Andean countries. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or 3/4 or 1 unit.
334. **The Structural Study of South American Indian Cultures.** A comparative discussion of cultural systems, including their social, religious, and economic aspects; in general, the better-known peoples of South America are considered. Prerequisite: Anthropology 332 or 333, or consent of instructor. 3 hours, or 3/4 or 1 unit.
337. **Behavior Genetics Laboratory.** Same as Psychology 347 and Ecology, Ethology, and Evolution 352. See Psychology 347.
339. **Anthropological Theory in Contemporary Perspective.** An exploration of current theory in social and cultural anthropology, with emphasis on examining theories in the light of contemporary ideas about theoretical adequacy and of the historical development of anthropological thought; designed especially for anthropology concentrators and anthropology graduate students. Prerequisite: Anthropology 230 or equivalent. 3 hours, or 3/4 or 1 unit.
340. **Human Evolution, I.** Principles of evolution and a survey of the evolution of man and his progenitors from the early primates through the Pleistocene epoch; emphasis on evolutionary theory as applied to man and interpretation of the fossil record. Prerequisite: Anthropology 240 or an introductory zoology course, or consent of instructor. 3 hours, or 3/4 or 1 unit.
341. **Human Evolution, II.** Same as Animal Science 341. The principles of human genetics; anthropological aspects of race and race formation; and hereditary and environmental factors in the biological variation of modern man. Prerequisite: Anthropology 240 or an introductory zoology course, or consent of instructor. 3 hours, or 3/4 or 1 unit.
342. **Behavior-Genetic Analysis.** Same as Ecology, Ethology, and Evolution 350 and Psychology 342. See Psychology 342.
343. **Introduction to Primate Morphology and Behavior.** Same as Ecology, Ethology, and Evolution 344. Survey of primate social behavior and the classification, morphology, and distribution of living and extinct species; emphasis on interrelationships with aspects of anthropological study. Prerequisite: Anthropology 240 or Ecology, Ethology, and Evolution 246, or consent of instructor. 3 hours, or 3/4 or 1 unit.
344. **Field and Laboratory Techniques in Biological Anthropology.** Supervised participation in biological anthropology research projects; techniques, methods, and procedures discussed and practiced under actual field or laboratory working conditions. Normally taken concurrently with Anthropology 345. Prerequisite: Anthropology 240 or equivalent; consent of instructor. 3 hours or 1 unit. May be repeated as topics vary. Usually offered in the summer session only.

345. **Analysis of Research Data in Biological Anthropology.** Analysis, interpretation, evaluation, and organization of field and laboratory data in biological anthropology; preparation of written reports on research. May be taken concurrently with Anthropology 344 or subsequently. Prerequisite: Anthropology 240 or equivalent; consent of instructor. 3 hours or 1 unit. May be repeated as topics vary. Usually offered in the summer session only.
346. **Animal Behavior.** Same as Animal Science and Ecology, Ethology, and Evolution 346. See Ecology, Ethology, and Evolution 346.
347. **Animal Behavior Laboratory.** Same as Animal Science and Ecology, Ethology, and Evolution 347. See Ecology, Ethology, and Evolution 347.
348. **The Prehistory of Africa.** The study of cultural development in Africa from the appearance of hominids to the time of European domination. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or 3/4 or 1 unit.
349. **South American Culture History, I.** An examination of the factors influencing the initial peopling of South America; the spread and diversification of hunting and gathering economies; and the development and spread of the tropical forest cultural pattern. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or 3/4 or 1 unit.
350. **South American Culture History, II.** An examination of the factors leading to the rise of civilization in the central Andes, including the evolution of agricultural systems, the elaboration of technology, and the emergence of extensive and complex political units. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or 3/4 or 1 unit.
351. **Archaeological Surveying: Techniques and Applications.** Familiarization with methods used in the location and recording of archaeological sites, including techniques of mapping especially adapted to the needs of archaeology; attention given to means of presenting results and interpreting data derived from this work; and work both in the field and in the laboratory. Prerequisite: Anthropology 220 or consent of instructor. 3 hours or 1 unit.
354. **Field Techniques in Archaeology.** Participation in archaeological excavations; techniques, methods, and procedures discussed and practiced under actual working conditions. Normally taken concurrently with Anthropology 355. May be repeated as topics vary. Prerequisite: Anthropology 102 or 110, or consent of instructor. 3 hours or 1 unit. Usually offered in the summer session only.
355. **Laboratory Techniques in Archaeology.** Laboratory work including processing, classifying, dating, interpretation, evaluation, and preparation of written reports of archaeological research. May be taken concurrently with Anthropology 354 or subsequently. May be repeated as topics vary. Prerequisite: Anthropology 102 or 110, or consent of instructor. 3 hours or 1 unit.
356. **Human Osteology.** Identification of human skeletal material and basic techniques of measurement; methods of determining age, sex, race, and stature from the human skeleton; and analysis of skeletal populations. Prerequisite: Anthropology 102 or 110; or a course in anatomy, physiology, or introductory zoology and consent of instructor. 3 hours or 1 unit.
357. **Midwestern Prehistory.** A detailed study of the midwestern archaeological area covering the broad cultures with regional variations considered chronologically and stressing their interrelationships. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or 3/4 or 1 unit.
358. **Prehistory of the Old World: Paleolithic and Mesolithic.** Considers the origins of human culture and surveys the development of and relationships among cultural traditions in Africa, Asia, and Europe during the Pleistocene epoch. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or 3/4 or 1 unit.
360. **Peoples and Cultures of Oceania.** Same as Asian Studies 360. A survey of the Pacific Islands; regional geography, human ecology, culture history, and ethnography of Melanesia, New Guinea, Polynesia, New Zealand, Micronesia, and Australia; and some consideration of Pacific ethnohistory and the role of Oceania in the modern

world. Prerequisite: Anthropology 110, or 102 and 103; or consent of instructor. 3 hours, or 3/4 or 1 unit.

361. **Peoples and Cultures of Mexico and Guatemala.** A survey of the peoples and cultures of middle America with special emphasis upon Mexico and Guatemala; begins by placing middle America geographically, historically, and culturally within the broader Latin American scene; countries first viewed as a whole and then selected ethnographic studies of specific communities considered for comparative purposes. The Caribbean is not included in this survey. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or 3/4 or 1 unit.
362. **Asian Prehistory.** Same as Asian Studies 362. An examination of archaeological data, primarily up to the metal ages, for the major areas of Asia; detailed consideration of developmental, diffusionist, and systems models for explaining these data.. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or 3/4 or 1 unit.
363. **Religion in Anthropological Perspective.** Same as Religious Studies 363. An introduction to the study of magical and religious beliefs and practices in tribal and peasant societies; considers theories of the nature, origin, and function of magic and religion; myth, ritual, and symbolism; the relationship between great folk religious traditions; and socioreligious movements. Prerequisite: Anthropology 230 or 260, or consent of instructor. 3 hours, or 3/4 or 1 unit.
364. **Field Work in Cultural Anthropology.** Supervised participation in field research in ethnography, ethnology, linguistics, or social anthropology; techniques, methods, and procedures discussed and practiced under actual working conditions. Normally taken concurrently with Anthropology 365. May be repeated as topics vary. Prerequisite: Anthropology 230 or 300; some knowledge of the language of the area concerned; consent of instructor. 3 hours or 1 unit. Usually offered in the summer session only.
365. **Analysis of Field Data in Cultural Anthropology.** Analysis, interpretation, evaluation, and organization of field data in cultural anthropology; preparation of written reports on research in ethnography, ethnology, linguistics, or social anthropology. May be taken concurrently with Anthropology 364 or subsequently. May be repeated as topics vary. Prerequisite: Anthropology 230 or 300; some knowledge of the language of the area concerned; consent of instructor. 3 hours or 1 unit.
367. **Cultures of Africa.** Culture and social organization in traditional African societies with emphasis on the politics, kinship, and religion of a small sample of societies illustrating the main cultural variations found in sub-Saharan Africa; some discussion of ecological factors and ethnic group relations in precolonial times. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or 3/4 or 1 unit.
368. **Peoples and Cultures of India.** Same as Asian Studies 368. A description and analysis of the social, economic, and religious life of the tribal and peasant peoples of contemporary India considered against the background of Indian geography, population, language distribution, the caste system, and highlights of Indian cultural development. Prerequisite: Anthropology 168 or 230, or consent of instructor. 3 hours, or 3/4 or 1 unit.
370. **Language, Culture, and Society.** Same as Communications 370 and Linguistics 370. An examination of the social and cultural functions of language with particular emphasis on the application of linguistic methods and findings to selected problems in the social sciences. Prerequisite: Anthropology 230, or one course in communications or linguistics, or consent of instructor. 3 hours, or 3/4 or 1 unit.
371. **Culture and Personality.** A cross-cultural comparative analysis and evaluation of current theories of culture and personality formation; concerned with the sociocultural matrix in which personality develops as well as with the application of personality concepts to the study of primitive and modern society. Prerequisite: An introductory course in anthropology, sociology, or psychology, or consent of instructor. 3 hours, or 3/4 or 1 unit.

372. **The Anthropological Study of Art.** A review of the anthropological approach to art with emphasis on structural analysis and the relationship of the artist to his culture; consideration of problems of stylistic development within the framework of cultural dynamics and a survey of the major art styles outside of the Western tradition and the Orient. Prerequisite: Three hours of anthropology or consent of instructor. 3 hours, or 3/4 or 1 unit.
373. **Theory and Method in the Cross-Cultural Study of Individual Behavior.** Same as Psychology 373. See Psychology 373.
375. **Mesoamerican Culture History, I.** The origins of complex culture and civilization in Mexico and Guatemala; beginning with the earliest hunting-gathering cultures, examines the processes leading to complex agricultural societies. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or 3/4 or 1 unit.
376. **Mesoamerican Culture History, II.** The major civilizations of Mexico and Guatemala, emphasizing Teotihuacan and the Toltecs, Aztecs, and Maya; examines factors leading to the rise of urbanization and the maintenance and collapse of these civilizations. Prerequisite: Anthropology 375 or consent of instructor. 3 hours, or 3/4 or 1 unit.
377. **Social Change in Africa.** Considers problems of social change in Africa from the beginning of the colonial period; topics considered include colonialism in Africa, nationalism, urbanization and labor migration, changing patterns of leadership, and changes in family structure. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or 3/4 or 1 unit.
378. **Sociocultural Factors in African Economic Development.** Same as Rural Sociology 378. An examination of the African "development environment" and of the social and cultural factors which affect economic development in the African continent. Drawing from case studies and individual country experiences in development, emphasis is placed on the social, cultural, and institutional factors which influence economic decisions at farm, ethnic, national, and regional levels. Prerequisite: A course on Africa or international economic development. 3 hours, or 3/4 or 1 unit.
379. **Medical Anthropology: The Culture of Health and Illness.** An introduction to concepts and social aspects of health, illness, and curing in different cultures with consideration also of the interaction between folk and modern medicine in developing nations and the delivery of health care as an international social problem. Prerequisite: Anthropology 230 or 260, or consent of instructor. 3 hours, or 3/4 or 1 unit.
381. **Russian Culture History and Ethnology.** Same as Geography 381. An historical and structural analysis of the development of Russian culture, especially the peasant traditions, from Danubian to contemporary times. 3 hours, or 3/4 or 1 unit.
382. **Siberian Culture History and Ethnology.** Same as Geography 382. An ecological analysis of historic and present-day Siberian cultures, with comparisons to arctic America. 3 hours, or 3/4 or 1 unit.
383. **Self and Society in Japan.** Same as Asian Studies 383. The lifecourse and the growth of the self in modern Japanese civilization. Prerequisite: Anthropology 230 or a course in East Asian history, or consent of instructor. 3 hours, or 3/4 or 1 unit.
385. **Anthropology of Education.** Same as Educational Psychology 385 and Educational Policy Studies 385. See Educational Policy Studies 385.
386. **Peoples and Cultures of Mainland Southeast Asia.** Same as Asian Studies 386. The culture, cultural history, and social systems of mainland Southeast Asia: Burma, Thailand, Cambodia, Vietnam, Laos, Assam Hills, upland southwestern China, and Malaya; emphasis on the interaction of complementary ethnic types in the context of local ecology and the Hindu-Buddhist systems of religion and politics of the lowland states. Prerequisite: Anthropology 220 or 230, or consent of instructor. 3 hours, or 3/4 or 1 unit.
387. **Peoples and Cultures of Insular Southeast Asia.** Same as Asian Studies 387. A survey of the cultures and social systems of Indonesia, Malaysia, and the Philippines in the context of the region's history and geographical, economic, political, and

religious situation. Prerequisite: Anthropology 220 or 230, or consent of instructor. 3 hours, or 3/4 or 1 unit.

388. **Prehistory of Oceania.** Same as Asian Studies 388. Archaeology and physical anthropology of the Pacific Islands; early hominids in Australia and New Guinea; evolution and genetics of Oceania populations; origins of Pacific Islanders; traditional voyaging; and settlement and culture history of aboriginal Australia, Melanesia, Micronesia, and Polynesia. Prerequisite: Anthropology 220, 240, or 360. 3 hours, or 3/4 or 1 unit.
394. **Human Paleopathology.** Comprehensive study of the evidence of human disease in antiquity, emphasizing diagnosis of skeletal pathologies, and the anthropological interpretation of historic and prehistoric disease patterns. Prerequisite: Anthropology 356, a course in human anatomy, or equivalent. 3 hours or 3/4 or 1 unit.
398. **Combined Graduate and Undergraduate Seminar.** A research seminar on specialized topics in anthropology. Prerequisite: Consent of instructor. 4 hours or 1 unit. Students may register in different sections for a total of 8 hours or 2 units; may be repeated in the same semester.
400. **Introduction to General Linguistics.** Same as English as a Second Language 402 and Linguistics 400. See Linguistics 400.
429. **The Evolution of Agricultural Economies.** Same as Agronomy 429 and Geography 429. The problems concerning the development of the several basic food crop economies studied from the point of view of geographical environment, the available archaeological and ethnographic evidence, and agronomy and plant genetics; regional emphasis varies from year to year. Prerequisite: Consent of instructor. 1 unit.
440. **Problems in Physical Anthropology.** A seminar designed to involve students in the theoretical and methodological approaches to problem areas in physical anthropology. May be repeated for additional credit. Prerequisite: Anthropology 340, 341, or 343; consent of instructor. 1 unit.
443. **Problems in Primate Behavior and Ecology.** Same as Ecology, Ethology, and Evolution 443. Group discussions and individual presentations of research reports and problems in fields of primate ethology, ecology, evolution, and related subjects; topics vary each semester. Prerequisite: Consent of instructor. 1/2 or 1 unit. May be repeated for additional credit.
450. **Seminar in Anthropology.** Analysis of selected topics of special interest in anthropology. 1/2 or 1 unit. May be repeated to a maximum of 2 units.
451. **Social Structure.** Intended to deepen training of advanced students in the descriptive techniques and methods of structural and functional analysis currently employed by social anthropologists. Prerequisite: Consent of instructor. 1 unit.
452. **Research Problems in Archaeology.** Seminar oriented to current research problems in archaeology, designed to acquaint students with theoretical and methodological aspects of particular problems and to develop a critical perspective of archaeological research. May be repeated for additional credit. Prerequisite: Consent of instructor. 1 unit.
453. **The Formal Analysis of Kinship Systems.** A survey of a variety of the world's systems of kinship, marriage, and family organization; concentration on the distinctive properties of kinship systems as a species of social structure, on the formal apparatus for describing and understanding them and their functions, and on the theory of kinship that arises from the use of such formal apparatus. Prerequisite: Consent of instructor. 1/2 to 1 unit.
454. **Ritual and Power in Social Life.** A systematic examination of the relationship between power structure and ritual by reference to anthropological theory and through consideration of select ethnographies; social stratification, social networks, cultural symbolism, and ethnicity. Prerequisite: Consent of instructor. 1 unit.
460. **History of Anthropological Theory.** A consideration of the development of anthropological thought, particularly in ethnology and social anthropology; special attention to major figures, problem-shifts, and new paradigmatic approaches. Prerequisite: Graduate standing in anthropology or consent of instructor. 1 unit.

- 463. Seminar on Field Methods and Research Designs in Cultural Anthropology.** Critical examination of field methods and research designs as reflected in selected studies covering the past seventy years, ranging from early missionary reports to those of contemporary field workers; effort made to discern major trends in methodology; and examination of community studies and comparative studies on both the tribal and peasant levels. Prerequisite: Consent of instructor. 1 unit.
- 489. Readings in Anthropology.** Individual guidance in intensive readings in the literature of one or more subdivisions of the field of anthropology, selected in consultation with the adviser in accordance with the needs and interest of the student. Prerequisite: One semester of graduate work in anthropology; consent of adviser. 1/2 or 1 unit.
- 490. Individual Topics in Anthropology.** Supervised individual investigation or study of a topic not covered by regular courses. The topic selected by the student and the proposed plan of study are approved by the adviser and the staff member who supervises the work. Prerequisite: Consent of instructor. 1 to 4 units.
- 499. Thesis Research.** Preparation of theses. 0 to 4 units

ARABIC

(See Linguistics)

ARCHITECTURE, SCHOOL OF

Director: R. Alan Forrester (Acting Director)

School Office: 106 Architecture Building, 608 E. Lorado Taft Drive, Champaign

- 101. Introduction to Environmental Design.** Provides the basis for a critical assessment of present community environments; considers the forces and tools that shape communities; and discusses how better environmental planning, environmental design, and development and redevelopment can help create, preserve, and restore valued qualities in our communities. 4 hours.
- 171. Architectural Design, I.** Formal fundamentals of architectural design; formal vocabulary, principles, and concepts of architectural design; basic design methods; skills development in sketching, drafting, rendering, layout, diagramming, modeling, and lettering; and creative problem-solving in two- and three-dimensional exercises. Prerequisite: General Professional Courses in Art and Design 187 or equivalent and sophomore standing. 3 hours.
- 172. Architectural Design, II.** Functional fundamentals of architectural design; functional vocabulary, principles, and concepts of architectural design; basic design and programming methods; skills development in drafting, modeling, layout, rendering, and sketching; and creative problem-solving in two- and three-dimensional exercises. Prerequisite: Architecture 171 and General Professional Courses in Art and Design 188. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Senior Honors in Architecture.** For candidates for honors in architecture. Independent guided study and research in a selected area of architecture. Prerequisite: Senior standing in architecture, a University grade-point average of 4.0 or, in special cases, consent of director of School. 3 hours (summer session, 1 to 3 hours). May be repeated to a total of 6 hours with consent of director of School.
- 210. Introduction to the History of Architecture.** Visual and cultural analysis of selected buildings, urban spaces, and cities, from ancient Greece to modern times; emphasizes the architectural traditions of western civilization, especially as they

- affect the built environment of America and the Middle West. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
220. **Introduction to Architectural Theory.** Overview of the purpose and means of architecture in relation to other human endeavors and the goals of society; professional alternatives; introduction to research, cognitive processes in design, information handling, communication, and evaluation. Prerequisite: Consent of instructor. 3 hours.
231. **Architectural Construction, I.** An introduction to building construction for design professionals. Includes the study of materials, products, and systems for buildings and the criteria for their selection, with emphasis on wood and masonry construction; legal and economic implications and cost control; and written and graphic communications for construction. Prerequisite: Sophomore standing in architecture or consent of School. 4 hours.
232. **Architectural Construction, II.** The building process; the architect-engineer, builder, and manufacturer; further study and analysis of materials, products, and systems, with emphasis on noncombustible and fire-resistive building construction; building code and zoning requirements; and specifications. Includes a study of building construction through the preparation of architectural and structural working drawings. Prerequisite: Architecture 231. 4 hours.
241. **Environmental Technology, I.** The integration of environmental control systems in architecture. Includes factors affecting comfort, health, safety, and energy conservation; the fundamentals of atmospheric conditioning of buildings and the equipment and controls systems for varying functions and sizes of buildings; and water supply, waste sewage, and storm-water disposal systems for buildings. Prerequisite: Architecture 232 or consent of instructor. 4 hours.
242. **Environmental Technology, II.** The integration of environmental control systems in architecture. Includes the nature of light illumination and vision, quality and quantity, and sources; integration of illumination and architecture; power distribution systems and equipment; and the nature of sound and architectural acoustics, room acoustics, and sound isolation. Prerequisite: Architecture 232 or consent of instructor. 4 hours.
251. **Statics and Dynamics.** Introduction to basic statics and dynamics with emphasis on architectural applications. Prerequisite: One year of analytical geometry and calculus. 4 hours.
252. **Strength of Materials and Design Applications.** Introduction to strength of materials with emphasis on architectural applications. Prerequisite: Architecture 251. 4 hours.
271. **Architectural Design, III.** The building in its environmental setting; introductory building design and site planning theory; principles of energy efficient building design; man-environment relationships theory; and architectural design and presentation methods. Prerequisite: Architecture 172 and General Professional Courses in Art and Design 189. 3 hours.
272. **Architectural Design, IV.** Buildings in the community setting; introductory urban design and site planning theory; man-environment relationships theory; and architectural design and presentation methods. Prerequisite: Architecture 271. 3 hours.
299. **Study in Versailles, France.** Study in the University of Illinois Architectural Program at Versailles, France. Prerequisite: Concurrent registration in the full-time program at Versailles through the Chicago Circle or Urbana-Champaign Campus. 0 credit.
300. **Independent Studies in Urban Design.** The individual study of selected topics involving the history, design, and function of significant European cities. Prerequisite: One year of history of architecture or history of art; consent of instructor. 3 hours or 3/4 unit.
301. **Independent Study.** Independent guided study and investigation in a selected area of architecture. Prerequisite: Junior standing in architecture, written proposal

approved by sponsoring faculty member and approval of director of School. 0 to 4 hours, or 0 to 1 unit.

310. **Ancient Architecture.** Architecture and urban design in ancient Egypt, Greece, and Rome. Prerequisite: Architecture 210, History of Art 111, or consent of instructor. 3 hours or 3/4 unit.
311. **Early Christian and Byzantine Architecture.** Architecture and urban design of the early Christian era, the Byzantine Empire, southeastern European lands under Byzantine cultural influence, and medieval Russia; from circa 300 to circa 1500. Prerequisite: Architecture 210, History of Art 111, or consent of instructor. 3 hours or 3/4 unit.
312. **Medieval Architecture.** The development of Romanesque and Gothic architecture and urban design. Prerequisite: Architecture 210, History of Art 111, or consent of instructor. 3 hours or 3/4 unit.
313. **Renaissance Architecture.** Developments in architecture, urban design, and garden art in Italy and northern Europe in the fifteenth through the sixteenth centuries. Prerequisite: Architecture 210, History of Art 112, or consent of instructor. 3 hours or 3/4 unit.
314. **Baroque and Rococo Architecture.** Developments in architecture, urban design, and garden art in Italy, France, Germany, and England in the seventeenth and eighteenth centuries. Prerequisite: Architecture 210, History of Art 112, or consent of instructor. 3 hours or 3/4 unit.
315. **Modern European Architecture.** The evolution of continental and British architecture and urban planning from 1750 to the present; includes some allusion to Japanese and American architecture of the same period. Prerequisite: Architecture 210, History of Art 112, or consent of instructor. 3 hours or 3/4 unit. May be repeated with consent of instructor.
316. **Modern American Architecture.** The development of American architecture and urban planning from the seventeenth century to the present. Prerequisite: Architecture 210, History of Art 112, or consent of instructor. 3 hours or 3/4 unit.
317. **Seminar on Great Modern Architects and Their Work.** Seminar on selected topics addressing the philosophy, theory, personality, and work of famous architects since the mid- eighteenth century. Prerequisite: Architecture 210; and Architecture 315 or 316, or equivalent; and consent of instructor. 3 hours or 1 unit.
318. **History of the Urban Environment.** Examines the evolution of town planning and urban design in Western civilization from prehistory to present; studies cultural and technical advancements affecting the form of the urban environment. 3 hours or 3/4 unit.
319. **Historic Building Preservation.** Introduces historic preservation: legal, financial, and administrative assistance, graphic examination of restored buildings and sites, and application of conservation technology. 3 hours or 3/4 unit.
323. **Social and Behavioral Factors for Design.** A research- oriented introduction to existing social and behavioral knowledge, methods, and tools for relating man to his physical and social environment, with implications for theories and a philosophy of architectural design. Prerequisite: Consent of instructor. 3 hours or 3/4 unit.
330. **Architectural Practice.** The role of the architect, professional ethics, and the conduct of professional practice; legal aspects of architectural practice and building construction; business management, operational procedures, financial planning, and cost control; and the administration of construction contracts and professional construction management. Prerequisite: Professional degree candidacy or consent of instructor. 3 hours or 3/4 unit.
331. **Design Development and Construction Documents.** To be taken with Architecture 373. Network diagram scheduling of professional services; preliminary project investigations of site conditions and facilities, building law, and economic considerations; the integration of materials, structure, mechanical equipment, illumination, and acoustics; design development outline specifications and drawings; the production planning, scheduling, and budgeting for working drawings and specifications; and preparation of portions of these documents. Prerequisite:

Architecture 241, 242, and 352; concurrent registration in Architecture 373. 3 hours or 3/4 unit.

341. **Solar Thermal Systems in Architectural Design.** The effects of solar energy collection and storage devices and techniques on building geometries; includes passive and active solar thermal systems in the architectural design process. Prerequisite: Architecture 241 or 242 or equivalent, and consent of instructor. 3 or 4 hours, or 3/4 or 1 unit. Students seeking 4 hours or 1 unit of credit must participate in research teams pursuing prearranged topics related to the course of study.
342. **Energy Management in Architecture.** Energy management; energy alternatives; and the influence of energy regulation on the architectural design, operation, maintenance, use, and re- use of buildings. Prerequisite: Architecture 241 and 242. 3 or 4 hours, or 3/4 or 1 unit. Students seeking 4 hours or 1 unit credit must participate in research teams pursuing prearranged topics related to the course of study.
351. **Theory and Design of Metal Structures.** Analysis and design of structures in metal; beams; open-web joists; metal deck; columns; riveted, bolted, and welded trusses; plate girders and connections; lateral loads and bracing; and design of a simple steel frame building. Prerequisite: Architecture 252. 4 hours or 1 unit.
352. **Theory of Reinforced Concrete.** Concrete materials; behavior of reinforced concrete construction; behavior and design of structural elements, one-way slabs, beams, and girders; columns; ACI code requirements; and introduction to continuity in reinforced concrete structures. Prerequisite: Architecture 252. 4 hours or 1 unit.
353. **Reinforced Concrete Design.** Selection, design, and comparison of reinforced concrete floor systems for buildings; study and design of columns and footings; and prestressed concrete. Prerequisite: Architecture 352. 4 hours or 1 unit.
354. **Structural Planning.** General problems in the selection and design of structural systems for buildings; methods of analysis; site explorations, soils, and foundations; bracing; and special systems. Prerequisite: Architecture 351 and 352. 4 hours or 1 unit.
355. **Structural Analysis.** Advanced problems in the analysis of statically determinate structures; general theories and methods of analysis of statically indeterminate structures by geometric and energy methods; and introduction to theory of plastic design. Prerequisite: Architecture 351 and 352. 4 hours or 1 unit.
371. **Architectural Design V.** Intermediate building and environmental design; issue-oriented building problems; urban design theory; intermediate building design and site planning theory; human-environment relationships theory; and architectural design and presentation methods. Prerequisite: Architecture 272. 6 hours. No graduate credit.
372. **Architectural Design and Construction Documentation.** Schematic design, design development, and construction documents of a small scale (10,000 square feet) public building emphasizing the integration of the basic elements of building, structural, and environmental technologies. Prerequisite: Architecture 371; credit or concurrent registration in Architecture 241 and 242. 6 hours. No graduate credit.
373. **Architectural Design Studio.** Design studies of intermediate-size building types; planned communities; civic and social facilities at the community and urban scale; and collaboration among the several disciplines involved in planning the human habitat: urban planning, landscape architecture, sociology, and economics. Studio with two theory lectures per week. Prerequisite: Architecture 372; concurrent registration in Architecture 331. 6 hours or 1 1/2 units.
374. **Architectural Design Studio.** Research and individual comprehensive design study for a selected architectural project; special emphasis on site development and the integration of construction technology, structure, and environmental systems. Prerequisite: Architecture 331 and 373, or consent of instructor. 6 hours or 1 1/2 units.
379. **Urban Housing.** A study of housing needs, comparative means of financing, comparative building types and costs, and contemporary examples of public and

private housing in Europe and the United States. Prerequisite: Consent of instructor. 2 hours or 1/2 unit.

398. **Directed Research in Architecture.** Participation in on- going research projects which may include energy management, environmental perception, facilities development, building science, and other topics. Prerequisite: Approval of written proposal by instructor and director of School. 4 hours or 1 unit. Students may register in different sections of this course for a total of 8 hours or 2 units.
399. **Off-Campus Study.** Provides opportunity for approved off- campus study. A detailed proposal for study off campus must be submitted for approval to the appropriate committee in the School prior to such study. Final determination of credit and its application toward the degree is made after a review of the student's off-campus work by the above committee and the director of School. Prerequisite: Senior or graduate standing in architecture and approval of program prior to registration. 0 to 12 hours, or 0 to 3 units.
410. **Seminar in Architectural History.** Seminar in the history of architecture dealing with various themes related to two or more historical periods or cultures. Prerequisite: Three 300-level history of architecture courses, or equivalent as determined by the instructor. 1 unit. May be repeated to a maximum of 3 units.
411. **Seminar in History of Ancient and Medieval Architecture.** Seminar on topics in ancient, early Christian, Byzantine, and Medieval Architecture. Prerequisite: Architecture 310, 311, or 312, or equivalent as determined by the instructor. 1 unit.
413. **Seminar in History of Renaissance and Baroque Architecture.** Seminar on topics in European architecture from the fifteenth through the eighteenth centuries. Prerequisite: Architecture 313 and 314, or equivalent as determined by the instructor. 1 unit.
415. **Seminar on the Architectural History of American Communities.** Advanced historic study of the architectural design and aesthetics of individual buildings and their relationship to each other in selected small-scale American communities. Prerequisite: Architecture 316 or equivalent, and consent of instructor. 1 unit.
417. **Seminar in the Development of Contemporary Architectural Thought.** An examination of the development of the philosophy of significant modern and contemporary architectural writers and architects in relation to their projects and executed work. Prerequisite: Architecture 315 and 316, or equivalent as determined by the instructor. 1 unit.
418. **Recording Historic Buildings.** Examines techniques for recording historic buildings and sites: measuring, photographing, and drawing to Historic American Building Survey standards; taking field notes and investigating public records to document reports. Prerequisite: Demonstrated ability in architectural graphics and Architecture 319; or consent of instructor. 3/4 unit.
430. **Organizational Behavior in the Architectural Process.** Application of the systems approach and organization theory to the study of organizational behavior in the architectural process; the sources and objectives of dynamic change in that process; and the effects of the change. 1 unit.
431. **Administration of Construction.** Critical analysis of that phase of architectural practice related directly to the construction of buildings; the building industry; policy, organization, procedures, and techniques for construction management; the architect, engineer, management and cost consultants, contractor, and the owner; and administration of the construction contract and professional construction management. Prerequisite: Architecture 330 and 331, or consent of instructor. 3/4 or 1 unit. Students taking the course for 1 unit are required to perform independent study which results in a written paper and formal class presentation.
432. **Architectural Administration.** Critical analysis of that part of professional practice related to the organization of the architectural firm and the conduct of the internal aspects of business; administrative policy, management functions, and procedures; and general development, contract negotiation, production, personnel, insurance, financial planning, accounting, and cost control. Prerequisite: Architecture 330 and 331, or consent of instructor. 3/4 or 1 unit. Students taking the course for 1

unit are required to perform independent study which results in a written paper and formal class presentation.

434. **Building Economics.** Principles of economics as they apply to individual and large-scale building projects; factors affecting the cost of buildings, including the building market, building investment and finance, land acquisition, government assistance, and taxation; first costs, operating costs, and ultimate costs; cost analysis and cost models; and construction costs, estimates, and cost control. Prerequisite: Architecture 330 and 331, or consent of instructor. 1 unit.
436. **Theory of Materials and Systems Selection.** The principles of decision theory as they apply to the architectural design process in the selection of materials, products, methods, and systems of building construction; factors affecting decision making: function, cost, and aesthetics; and defining the problem, developing alternatives, and final decision. Prerequisite: Architecture 434 or consent of instructor. 3/4 to 1 unit.
438. **Architectural Problems in Organization Theory.** Individual or group examination and analysis of the application of the theory of complex organizations in the architectural process; analysis of the interaction of architectural and other building organizations as subsystems; and investigation of this interaction through research or project analysis. Prerequisite: Architecture 430 and Business Administration 409, or consent of instructor. 1 or 1 1/2 units.
439. **Architectural Process Internship.** Individual internship for one summer session or one semester in an approved office of practice in the architectural process; analysis of this work in coordinated university coursework. Residence at the university is not required during internship. Prerequisite: Consent of joint program advisory committee. 1 or 1 1/2 units.
451. **Advanced Structural Analysis.** Advanced theory and methods of analysis of statically indeterminate structures; secondary stresses; torsion; buckling and stability; and advanced theory and application of plastic design in building structures. Prerequisite: Architecture 355 or consent of instructor. 1 unit.
452. **Foundation Engineering.** Soil mechanics and site exploration; design of spread footings, combined footings, piles, and caissons; and foundation walls and retaining walls in reinforced concrete. Prerequisite: Architecture 355 or consent of instructor. 1 unit.
453. **Advanced Reinforced Concrete Design.** Critical review of the analysis, methods, and specifications involved in the design and behavior of reinforced concrete structures for buildings, including tall buildings, plates, and shells; computer applications. Prerequisite: Architecture 355; credit or concurrent registration in Architecture 451 or consent of instructor. 1 unit.
454. **Advanced Steel Design.** Advanced topics in the design of steel structures; critical study of the AISC specification; design of steel members and their connections; composite structures; and analysis and design of continuous structures and tall buildings. Prerequisite: Architecture 451 or consent of instructor. 1 unit.
455. **Prestressed Concrete Design.** Theory and design of prestressed concrete structures; suspension shell structures. Prerequisite: Architecture 453 or consent of instructor. 1 unit.
456. **Advanced Structural Planning.** Study of the loads, functional and spatial requirements, and construction problems in the selection and design of structural systems for buildings; cost estimates; and integration of mechanical and electrical equipment. Prerequisite: Architecture 452 and 453; credit or concurrent registration in Architecture 454 and 455, or consent of instructor. 1 unit.
461. **Housing Environments Design Studio, I.** Emphasizes comprehensive design studies on individually selected housing problems; the study process includes programmatic development, environmental analysis, definitive design development and comprehensive project documentation. Prerequisite: Architecture 374 and 466. 1 to 2 units.
462. **Housing Environments Design Studio, II.** Terminal design studio studies on individually selected housing problems; emphasizes definitive design development

- and process documentation for final project in the Master of Architecture Housing Environments option. Prerequisite: Architecture 461. 1 to 2 units.
463. **Methods of Social and Behavioral Research in Designed Environments.** Same as Landscape Architecture 463. Introduction to methods and techniques of systematically generating social and behavioral information relevant to the programming, design, and evaluation of physical environments. Prerequisite: Graduate standing in architecture, landscape architecture, or urban and regional planning. 1 unit.
464. **Conducting Social and Behavioral Research in Designed Environments.** Same as Landscape Architecture 464. See Landscape Architecture 464.
465. **Design/Behavior Studio.** Same as Landscape Architecture 465. See Landscape Architecture 465.
466. **Problems and Processes in Housing Design.** Analyzes issues confronting architects in the design of housing environments emphasizing new and emerging problems; examines processes in problem solutions. Prerequisite: Concurrent registration in Architecture 374 or consent of instructor. 1 unit.
467. **Critical Issues in Designing for the Elderly.** Examines issues related to the design of housing and community facilities for older people; stresses the development of strategies for design decision-making and a comprehensive theoretical knowledge base for understanding how the design of the environment affects the aged. Prerequisite: Architecture 374 or consent of instructor. 1 unit.
468. **Site and Environmental Issues in Housing Design.** Examines issues involving housing environments as related to site, landscape, land planning, and buildings; also examines design values, processes, analysis techniques, and standards involving natural and human-made interactions. Prerequisite: Architecture 374 or consent of instructor. 1 unit.
471. **Architectural Design Studio.** Definitive design of various building types with optional choices related to the student's particular interests, talents, and capacities; emphasis on human need, structural, mechanical, and tectonic integration. Prerequisite: Architecture 374 or consent of instructor. 1 to 2 units.
472. **Architectural Design Studio.** Continuation of Architecture 471. Prerequisite: Architecture 471 or consent of instructor. 1 to 2 units.
476. **Architectural Design Seminar.** Presentations and discussions relative to various areas of architectural and environmental design concerns. Prerequisite: Architecture 374 or consent of instructor. 3/4 or 1 unit. May be repeated to a maximum of 3 units.
477. **Theory of Architecture.** A review of principles of architectural design; factors in programming architectural requirements; design development; and evaluation and criticism. Prerequisite: Architecture 374 or consent of instructor. 3/4 to 1 unit.
478. **Architectural Criticism.** Analysis and criticism of selected buildings; individual reports and discussions. Prerequisite: Architecture 477 or consent of instructor. 3/4 to 1 unit.
479. **Architectural Design Methods.** Examination of the architectural design process; identification, investigation, and evaluation of design methods. Prerequisite: Consent of instructor. 3/4 to 1 unit.
481. **Urban Design Studio, I.** Same as Landscape Architecture 481. Design of large building types and building complexes; megastructures; and collaboration with other disciplines in research related to urban development. Prerequisite: Architecture 374; credit or concurrent registration in Urban Planning 326 or consent of instructor. 1 to 2 units.
482. **Urban Design Studio, II.** Same as Landscape Architecture 482. Design development studies of central business districts, movement systems, and residential communities; collaboration with other disciplines in research related to urban development. Prerequisite: Architecture 481, Urban Planning 326, or consent of instructor. 1 to 2 units.

488. **Urban Design Seminar.** Analysis and criticism of urban development projects; individual reports and discussions. Prerequisite: Architecture 374, Urban Planning 326, or consent of instructor. 3/4 to 1 unit.
491. **Special Problems in Architectural History.** Individual investigation of the work of particular architects, of specific buildings, and of the architecture of periods or regions; comparative studies; and aesthetic problems. Prerequisite: Twelve hours of architectural history or consent of instructor. 3/4 to 3 units. May be repeated for a maximum of 3 units.
493. **Special Problems in Architectural Administration and Building Construction.** Studies of building projects at large and small scales; investigations in feasibility and cost control, material and system selection, construction techniques and processes, legal and business procedures, and related aspects of professional practice; and independent study or study in conjunction with architectural and urban design projects. Prerequisite: Architecture 331 or consent of instructor. 3/4 to 3 units. May be repeated for a maximum of 3 units.
495. **Special Problems in Structural Theory and Design.** Individual or group investigation and study in architectural engineering application; research in economy and design in correlation with architectural, mechanical, and structural requirements. Prerequisite: Consent of instructor. 1/2 to 3 units. May be repeated for a maximum of 3 units.
496. **Special Problems in Housing Environments.** Individual investigation or research in housing environments involving special issues such as energy conscious design, human- environmental relations, aesthetic theory, government policy, and cultural patterns. Prerequisite: Architecture 374 or consent of instructor. 3/4 to 1 1/2 units. May be repeated to a maximum of 3 units.
497. **Special Problems in Architectural Design.** Individual investigation of building types and systems, aesthetic theories, and other problems in architectural design. Prerequisite: Architecture 374 or consent of instructor. 3/4 to 3 units. May be repeated to a maximum of 4 units.
498. **Special Problems in Urban Design.** Individual investigation of problems at the community and urban scale; collaboration with other disciplines. Prerequisite: Credit or concurrent registration in Architecture 481 or Urban Planning 326, or consent of instructor. 3/4 to 3 units. May be repeated for a maximum of 3 units.
499. **Thesis Research.** Prerequisite: Consent of instructor and graduate program coordinator. 0 to 4 units. May be repeated for a maximum of 4 units

ART AND DESIGN, SCHOOL OF

(including Introduction to Art and Design, History of Art, General Professional Courses in Art and Design, Art Education, Cinematography, Crafts, Graphic Design, Industrial Design, Painting, Photography, Printmaking, and Sculpture)

Director of School: E. C. Wicks

School Office: 143 Art and Design Building, 408 E. Peabody, Champaign

Introduction to Art and Design

104. **Introduction to Screen Printing.** Introduction to traditional and contemporary methods of screen printing, equipment and materials, various methods of stencil preparation, and printing procedures and techniques. Not open to students majoring in art and design. 2 hours. May be repeated to a maximum of 4 hours.
105. **Introduction to Watercolor Painting.** A basic watercolor class that includes an introduction to the tools, materials, and techniques of the medium; landscape, still

life, and figure experiences. Not open to students majoring in art and design. 3 hours. May be repeated to a maximum of 6 hours.

106. **Introduction to Oil Painting.** Elementary oil and acrylic painting and sketches from still life and landscape; includes basics such as stretching canvas, preparing surfaces, and varied painting techniques. Not open to students majoring in art and design. 3 hours. May be repeated to a maximum of 6 hours.
107. **Elementary Drawing.** A basic drawing course using a variety of media and techniques, including charcoal, conte, pencil, pen and india ink, and studies in perspective, line, value, composition, and the figure. Not open to students majoring in art and design. 3 hours. May be repeated to a maximum of 6 hours.
108. **Japanese Ikebana (Flower Arrangement).** Introduction to the traditional arts of Japan, concentrating on Ikebana (Japanese flower arranging). 2 hours.
109. **Sumi-E (Japanese and Chinese Black-ink Painting).** Introduction to the ancient abstract Chinese art of black-ink painting; through the study and practice of Chinese and Japanese Sumi-E students discover the foundation of twentieth-century visual arts and discuss the philosophy of Chinese and Japanese art. 2 hours.
185. **Design, I.** Design elements and principles with emphasis on color and painting exercises; uses a variety of media to explore the different aspects of design, emphasizing two-dimensional problems. Not open to students majoring in art and design. 3 hours.
186. **Design, II.** A second course in design with emphasis on graphic communication; students gain experience using modern graphics equipment. Not open to students majoring in art and design. Prerequisite: Introduction to Art and Design 185. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
209. **Japanese Tea Ceremony and Zen Aesthetics.** The tea ceremony and culinary arts of Japan practiced as the physical discipline necessary for Zen aesthetic experience. Prerequisite: Introduction to Art and Design 108 or 109. 2 hours. May be repeated to a maximum of 4 hours

History of Art

101. **Introduction to Non-Western Art: East Asia.** Cultural analysis of the interrelated fields of architecture, sculpture, and painting, and other humanistic studies of East Asian civilizations; emphasizes India, China, and Japan. 3 hours.
110. **Introduction to Non-Western Art: Africa, the Americas, and Oceania.** Highlights of visual arts traditions in black Africa, pre-Columbian America, and the South Pacific; a cross-cultural analysis of non-Western aesthetic systems and forms with a focus on thematic problems rather than style surveys. 3 hours.
111. **Introduction to Ancient and Medieval Art.** Cultural analysis of the interrelated fields of architecture, sculpture, painting, and other humanistic studies previous to the Italian Renaissance. 4 hours.
112. **Introduction to Renaissance and Modern Art.** Cultural analysis of the interrelated fields of architecture, sculpture, painting, and other humanistic studies beginning with the Italian Renaissance and continuing through the Modern period. Prerequisite: History of Art 111 or consent of instructor for art students. 4 hours.
115. **Art Appreciation.** A broad introduction to the visual arts; surveys media representing the major cultural and historical periods, both Western and non-Western. In addition to required lectures and readings, campus art collections and exhibitions are visited periodically. 3 hours.
116. **Masterpieces of Art.** A presentation of selected masterpieces of the visual arts, both as outstanding documents and as great achievements in art. 3 hours.
210. **African Art.** An investigation of the characteristics and achievements of outstanding phases of the art of Africa. 3 hours.

215. **Greek Art.** Same as Classical Civilization 217. Survey of architecture, sculpture, and painting of the Greek world from the geometric period to the beginning of the Christian era. 3 hours.
216. **Roman Art.** Same as Classical Civilization 218. Survey of architecture, sculpture, and painting of the Roman world from republican times to the age of Constantine, with brief treatment of later Roman art leading to Byzantine. 3 hours.
217. **The Development of the Ancient City.** Same as Classical Civilization 231. See Classical Civilization 231.
218. **Ancient Greek Sanctuaries.** Same as Classical Civilization and Religious Studies 232. See Classical Civilization 232.
219. **The Classical Tradition in Art from the Renaissance to the Modern Age.** Examines the effect of the art of classical antiquity upon the works of some of the greatest artists from the Renaissance to the modern age; discusses works of art as much as possible in the language of comparison employed by their creators and the poets and critics of their time. 3 hours.
222. **Medieval Art.** The arts of Byzantium and Western Europe from the early Christian era to the Renaissance. 3 hours.
230. **Italian Renaissance Art.** Architecture, painting, sculpture, and minor arts of Italy during the Renaissance. 3 hours.
231. **Northern Renaissance Art.** Architecture, painting, sculpture, and minor arts of Europe outside Italy in the fifteenth and sixteenth centuries. 3 hours.
235. **Baroque and Rococo Art.** A study of European art and architecture during the period 1580 to 1750, emphasizing major masters such as Bernini, Caravaggio, Poussin, Rembrandt, Rubens, Velazquez, and Watteau. 3 hours.
240. **Art of the Nineteenth Century.** Architecture, painting, sculpture, and minor arts of France, Germany, Spain, and England in the nineteenth century. 3 hours.
241. **Twentieth-Century European Art.** A survey of the major artists and artistic movements in European painting and sculpture from postimpressionism to the present. 3 hours.
255. **History of European Cinema as Visual Art.** Art historical survey of classic European cinema emphasizing national styles and iconography and the relationship of film to the other arts. 3 hours.
256. **History of American Film as Visual Art.** Art historical survey of classic American films. 3 hours.
289. **Senior Honors in Art History-BA.** Independent guided research and study in a selected area of art history for candidates for the Bachelor of Arts in Art History with departmental distinction. Prerequisite: Senior standing in the Art History curriculum, a cumulative grade point average of 4.25, an art history grade point average of 4.5, and consent of instructor, department advisor, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
290. **Senior Honors in Art History-BFA.** Directed independent research and study for honors. Prerequisite: Senior standing in FAA art history, a cumulative grade point average of 4.0, and consent of instructor, advisor, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
291. **Individual Art History Topics.** Directed independent research or creative activity. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
301. **Chinese Art.** History of Chinese art from earliest times to the present. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
302. **Japanese Art.** History of Japanese art from earliest times to the twentieth century. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
303. **Intellectual Artists of China.** Studies selected artists including struggling recluses, fantasists, eccentrics, and individualists; examines the aesthetic and expressive content of their works within the content of their social and intellectual environment. 3 hours, or 3/4 or 1 unit.

304. **Space and Design in Japanese Art and Architecture.** Studies basic design principles in Japanese painting, pottery, costumes, architecture, gardens, and other crafts. Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
310. **West African Art.** A study in depth of West African art styles in time perspective and cultural context, with a special interest in the use of interdisciplinary source materials. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
311. **Traditional Art of Pacific Ocean Cultures.** A survey of traditional art in Polynesia, Melanesia, and Micronesia, including New Zealand and Australia; emphasis on major style areas and their historical and cultural significance. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
315. **The Archaeology of Greece.** Same as Classical Civilization 343. See Classical Civilization 343.
316. **The Archaeology of Italy.** Same as Classical Civilization 344. See Classical Civilization 344.
317. **The Ancient Ideal in Art and Literature.** Same as Classical Civilization 332 and Comparative Literature 306. See Classical Civilization 332.
322. **Early Medieval Art.** The arts of Byzantine and of western Europe from the early Christian Era through the Romanesque period. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
323. **Romanesque Art.** Art and architecture of the Romanesque period. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
324. **Gothic Art.** The arts of western Europe from the end of the Romanesque period until the Renaissance. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
330. **Problems in Italian Renaissance Art.** A special field in the history of painting, sculpture, and minor arts of Italy during the Renaissance selected for intensive study; special emphasis given to the study of the lives of artists and problems in style or iconography. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit. May be repeated to a maximum of 6 hours, or 1/2 or 2 units.
331. **Problems in Northern Renaissance Art.** A special field in the history of painting, sculpture, and minor arts of France, Germany, Spain, and England during the Renaissance selected for intensive study; special emphasis given to the study of the lives of the artists and problems in style or iconography. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit. May be repeated to a maximum of 6 hours, or 1/2 or 2 units.
332. **Italian Art of the Sixteenth Century.** Painting, sculpture, and minor arts in Italy from 1520 to 1590. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
335. **Baroque Art in Italy and France.** A study of painting, sculpture, and graphic work in Italy and France during the period 1580-1700 emphasizing such major masters as Bernini, Caravaggio, the Carracci, Cortona, La Tour, and Poussin. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
336. **Baroque and Rococo Art in the North.** A study of art and architecture in northern Europe from 1600 to 1750, with emphasis on Flemish and Dutch baroque painting; extensive treatment of the careers of Rembrandt and Rubens. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
337. **Spanish Art and Architecture.** A study of art and architecture in Spain from the sixteenth through the nineteenth centuries, with emphasis on the masters of the Golden Age; includes El Greco, Velazquez, Zurbaran, Montanes, Ribera, Cano, Murillo, and Goya. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
340. **Romantic Art.** A study of English, French, and German art from the end of the eighteenth century through 1840; focuses on revivalist movements, historicism, landscape art, and changing conceptions of art and artist during the period. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.

341. **Realism to Post-Impressionism.** A study of European art from 1850 to 1900, with emphasis on French painting. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
342. **German and Austrian Painting of the Late Nineteenth and Early Twentieth Centuries.** A survey of modern German and Austrian painters and pictorial movements from the 1890s to the period of Hitler, with special emphasis on the expressionist period. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
343. **The Art Nouveau in Europe.** A survey of the principal artists and artistic currents in the applied arts during the 1890s in Europe; emphasis on individual figures, with an attempt to define the common stylistic and theoretical assumptions of the period. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
344. **The Beginnings of Modernism: European Art from Post-Impressionism to World War I.** The pioneer movements in modern painting and sculpture, emphasizing the work and ideas of individual major figures. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
345. **Twentieth-Century Art in Europe: 1915-1945.** A study of the leading personalities and movements in European painting, sculpture, and architecture, with emphasis on painting. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
346. **Recent American Painting and Sculpture.** A critical survey of developments since World War II with emphasis on questions of quality and personal content and with consideration of the most current tendencies. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
347. **Modern Sculpture.** Development of the modern sculptural revolution from the late nineteenth century to recent times, with emphasis on the work of Rodin, Brancusi, Picasso, Lipschitz, Moore, and David Smith. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
350. **American Art to 1840.** Architecture, painting, sculpture, and minor arts of the colonies and the United States to 1840. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
351. **American Art: 1840-1900.** Architecture, painting, sculpture, and minor arts of the United States. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
352. **American Art: 1900-40.** Architecture, painting, sculpture, and photography in the United States. Additional work in the form of research papers is required of graduate students. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
355. **Studies in the History of Film as Visual Art.** Investigation of special problems in the history of film. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit. May be repeated to a maximum of 6 hours or 1 1/2 units.
357. **History of Photography to 1910.** History of photography from its origins to 1910, including both documentary and artistic approaches; considers relationships with other arts of the period. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
358. **History of Photography since 1910.** History of photography from 1910 to the present, including consideration of photographic theories; considers relationships with other arts of the period. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
360. **History of Printmaking.** Variations and artistic developments in fine prints from the fifteenth century to the present; an art historical survey, but emphasis included on techniques, aesthetics, connoisseurship, and personal contact with original examples. Enrollment limited. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
361. **Old Master Drawings.** An historical and critical survey of drawings from the late Middle Ages to the end of the nineteenth century; emphasis on drawings by artists

such as Pisanello, Leonardo, Michelangelo, Raphael, Rembrandt, Rubens, Watteau, Goya, Degas, and Van Gogh. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.

365. **Historiography of Art and the History of Art Criticism.** Origins and the development of the history of art criticism. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit.
366. **Introduction to Art Museology.** Survey of the art museum as a professional institution, its history, and present orientation; designed to acquaint prospective graduate students with the field of museum operation and to serve as background for students entering graduate courses in special fields of art museum practice (museology). Prerequisite: Consent of instructor. 4 hours or 1 unit.
401. **Seminar in Chinese Art.** Investigation of selected phases, concepts, and problems of the art of China; intensive reading and reports. Prerequisite: History of Art 301 or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
402. **Seminar in Japanese Art.** Investigation of selected phases, concepts, and problems of the art of Japan; intensive reading and reports. Prerequisite: History of Art 302 or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
410. **Seminar: African Art.** An intensive investigation of selected problems in the sculpture and other arts of Negro Africa. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
422. **Studies in Medieval Art.** Research seminar in subjects selected from the art and architecture of the medieval period in western Europe. Prerequisite: History of Art 322 or 324; effective reading knowledge of French or German; consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
430. **Seminar in Renaissance Art.** Special problems in the history of Renaissance art. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
435. **Seminar in Baroque Art.** Research seminar in problems selected from the art of seventeenth-century Europe. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
440. **Seminar in the Art of the Period 1750-1900.** An intensive study of selected problems in European art. Prerequisite: Consent of instructor. 1 unit. May be repeated to a total of 3 units.
441. **Seminar in Modern Art.** Investigation of special problems in the history of twentieth-century art. Students present reports of their research. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
446. **Seminar in Contemporary Art.** Intensive study of selected problems or artists. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
450. **Seminar in American Art.** Investigation of selected problems in the history of American art. Prerequisite: History of Art 350 and 351, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
464. **Seminar: Introduction to Methods and Criticism.** Prerequisite: Graduate standing in art. 1/4 to 1 unit.
465. **Seminar: Studies in the Development of Art History and Criticism.** The relation of art history and criticism: changing standards and criteria; intensive reading of selected critical works; and the writing of art criticism. Prerequisite: Consent of instructor. 1 unit.
466. **Art Curatorial Techniques.** An intensive course in the role, responsibilities, and duties of the art museum curator; demonstration and practice of curatorial techniques in researching; documenting, acquiring, transporting, handling, and conservation of works of art. Prerequisite: History of Art 366. 1 unit.
467. **Art Museum Administration and Education.** Two aspects of art museum work: (1) administration, covers trustee relations, methods of serving the public, fund raising, budgeting, staff organization, and program planning; (2) museum education. Students receive practice in the preparation of educational exhibitions and related educational materials. Prerequisite: History of Art 366. 1 unit.

468. **Art Museum Internship.** Introduction to actual supervised practice in one specialized department in an art museum: curatorial, educational, or administrative department. Prerequisite: History of Art 466 and 467. 1 unit.
492. **Individual Readings in the History of Art.** Directed readings in special fields or aspects of history of art not provided in depth by the current course offerings. Prerequisite: Consent of instructor. Sections A and B may be taken simultaneously. Registration allowed for each section is 1/2 to 1 unit.
499. **Thesis Research.** Guidance in research and writing theses for advanced degrees. Prerequisite: Graduate standing in history of art. 0 to 4 units

General Professional Courses in Art and Design

113. **Orientation to Art.** An overview of art professions in today's society. 0 credit.
117. **Drawing, I.** Theory and practice in the elements of drawing. Open only to students in fine and applied arts, interior design, and apparel design. Only students in curricula that specifically require this course may advance enroll. 3 hours.
118. **Drawing, II.** Continuation of General Professional Courses in Art and Design 117. Theory and practice in the elements of drawing. Open only to students in fine and applied arts, interior design, and apparel design. Only students in curricula that specifically require this course may advance enroll. Prerequisite: General Professional Courses in Art and Design 117. 3 hours.
119. **Design, I.** Theory and practice in the elements of two-dimensional design and the study of color. Open only to students in fine and applied arts, interior design, and apparel design. Only students in curricula that specifically require this course may advance enroll. 3 hours.
120. **Design, II.** Theory and practice in the elements of three-dimensional design. Open only to students in fine and applied arts, interior design, and apparel design. Only students in curricula that specifically require this course may advance enroll. Prerequisite: General Professional Courses in Art and Design 119. 3 hours.
121. **Drawing Theory.** Orthographic, oblique, and isometric projections and perspective. 2 hours.
122. **Drawing Theory.** Continuation of General Professional Courses in Art and Design 121. The science of shades and shadows in orthographic, oblique, and isometric projections and perspective. Prerequisite: General Professional Courses in Art and Design 121. 2 hours.
131. **Elementary Composition.** Pictorial composition in line, pattern, and color. Prerequisite: General Professional Courses in Art and Design 119. 2 hours.
132. **Elementary Composition.** Pictorial composition in line, pattern, and color. Prerequisite: General Professional Courses in Art and Design 131. 2 hours.
187. **Fundamentals of Drawing.** Basic drafting techniques, orthographic and oblique projections, perspective, shade and shadows, architectural and topographic forms. Prerequisite: Enrollment in Architecture curriculum. 2 hours.
188. **Freehand Drawing, I.** For students in architecture. Drawing three-dimensional form and space on a two-dimensional surface; introduction to the use of perspective in freehand drawing; and construction of geometric solids in space and drawing from nature in pencil, pen, and charcoal. Prerequisite: General Professional Courses in Art and Design 187 or equivalent; enrollment in architecture curriculum. 2 hours.
189. **Freehand Drawing, II.** For students in architecture. Continuation of General Professional Courses in Art and Design 188. Introduction to life drawing and abstract drawing problems utilizing watercolor, acrylics, and other color media. Prerequisite: General Professional Courses in Art and Design 188; enrollment in architecture curriculum. 2 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
295. **On-Location Studio.** Intensive course in art studio activities on location; see Timetable for topics, location, duration, credit, and cost. Prerequisite: Consent of instructor and director of the School. 1 to 8 hours.

398. **Art and Design Workshop.** An intensive course requiring full-time effort for a period of one to four weeks; see Timetable for medium/topic. Prerequisite: Junior, Senior, or Graduate standing in art and design, or consent of instructor. 1 to 4 hours, or 1/4 to 1 unit. May be repeated as topics vary.
493. **Seminar: Introduction to Methods and Criticism.** Prerequisite: Graduate standing in art. 1/4 to 1 unit

Art Education

103. **Introduction to Studio Arts.** Introductory studio experiences with a variety of art materials and techniques accompanied by visitations to artists' studios and museum tours. Not open to students majoring in art and design. 3 hours. Credit is not given for both Art Education 103 and 190.
140. **Introduction to Art.** A broadly based conceptual foundation for a critical understanding of the visual arts in contemporary society. Not open to students in art and design and architecture. 3 hours.
190. **Recreational Crafts, I.** Introduction to design and execution in crafts particularly adapted to work with children in schools, playgrounds, and summer camps. Primarily for recreation majors in physical education. Credit is not given for both Art Education 190 and 203. Prerequisite: Sophomore standing or consent of instructor. 2 hours.
191. **Recreational Crafts, II.** Continuation of Art Education 190. Prerequisite: Art Education 190. 2 hours.
203. **Art in the Elementary Grades, I.** Introductory laboratory experiences with the elements of design in the visual arts and with processes, materials, and activities appropriate for the elementary grades. Not open to students majoring in art. 3 hours. Credit is not given for both Art Education 203 and 190.
204. **Art Education Laboratory.** Art in the elementary and secondary schools; studio activities in a variety of materials and processes appropriate for use in the schools. Prerequisite: General Professional Courses in Art and Design 132 or Industrial Design 134, or consent of instructor. 2 to 4 hours. May be repeated to a maximum of 4 hours.
205. **Art in the Elementary Grades, II.** A continuation of laboratory experiences begun in Art Education 203 with processes, materials, and activities appropriate for the elementary grades. Not open to students majoring in art. Prerequisite: Art Education 203. 3 hours.
206. **Practicum in Teaching Art.** Supervised teaching of art to children augmented by a seminar; includes classroom preparation and evaluation. Prerequisite: Art Education 207 or consent of instructor. 4 hours.
207. **Art Curriculum Development and Practicum in the Elementary Schools.** Develops productive and appreciative art curricula for the elementary schools and provides class members with a weekly half-day visitation to the local elementary schools to observe and assist classroom teachers and art consultants in teaching art to children. For art education majors only. 3 hours.
208. **Organization of Public School Art Programs.** The selection and arrangement of content for different educational levels; study and evaluation of curricula, equipment, and supplies; and program supervision. Prerequisite: Art Education 207 or junior standing in art, or consent of instructor. 3 hours.
290. **Senior Honors in Art Education.** Independent guided research and study for honors. Prerequisite: Senior standing in art education, a cumulative grade point average of 4.0; and consent of instructor, advisor, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
291. **Individual Problems in Art Education.** Directed independent research or creative activity. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.

389. **Aesthetic Inquiry and Criticism in Art Education.** Theories of art, techniques of criticism, the meaning of artistic expression, and their relationship to the visual arts and art education. Prerequisite: Advanced standing in art education curriculum or consent of instructor. 3 hours or 3/4 unit.
390. **Advanced Art for Elementary Grades.** Advanced laboratory experiences in two-dimensional visual art techniques for elementary teachers, supervisors, and principals. Prerequisite: Art Education 205 or consent of instructor. 2 to 4 hours, or 1/2 or 1 unit.
489. **Issues in Art Education.** A study of fundamental issues affecting education in the visual arts; examines and explores the educational implications of the nature and value of art, the nature of the artist, and the development of the child as an artist and connoisseur. 1 unit.
490. **Curriculum Development in Art.** An analysis of curriculum organization in the visual arts; particular emphasis given to a range of curriculum positions in education and general research related to curriculum design. Prerequisite: Consent of instructor. 1 unit.
491. **Special Problems in Art Education.** Individual direction in research and in creative activity; thesis. 1/2 to 2 units.
499. **Thesis Research.** Guidance in research and writing theses for advanced degrees. Prerequisite: Graduate standing in art education. 0 to 4 units

Cinematography

180. **Introduction to Cinematography.** Introduction to the principles and techniques of cinematography as applied to individual expression. 3 hours.
280. **Basic Cinematography.** Fundamentals of the theory and practice of motion pictures as an art form, with emphasis on principles, tools, and techniques. Prerequisite: Cinematography 180 or consent of instructor. 3 hours.
291. **Individual Cinematography Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
380. **Cinematography.** Theory and practice of motion pictures as an art form; emphasis on individual creative production. Anticipated cost to the student for each semester is \$75 to \$200. Costs should be discussed with the instructor before enrollment. Prerequisite: Cinematography 280 or consent of instructor. 3 hours, or 1/2 to 1 unit. May be repeated to a total of 12 hours or 4 units.
480. **Cinematography Studio.** Individually directed research; expression through the cinema medium. Prerequisite: Enrollment in M.F.A. program and major in photography/ cinematography, or consent of the departmental graduate committee. 1/2 to 2 units. May be repeated for additional credit.
491. **Special Problems in Cinematography.** Directed individual creative activity or research. Prerequisite: Graduate standing in cinematography. 1/2 to 2 units. May be repeated to a maximum of 8 units

Crafts

160. **Jewelry, I.** The design and execution of simple jewelry and related metal forms, including study of characteristics of base and precious metals through forming, fabrication, decoration, and finishing processes. 2 hours.
161. **Jewelry, II.** Continuation of Crafts 160; further experience and experimentation with manipulative techniques, materials, and processes, emphasizing the lost wax casting technique. Prerequisite: Crafts 160. 2 hours.

170. **Ceramics, I.** The design and production of pottery by hand methods. Work covers the basic processes of forming, decorating, and firing. Prerequisite: Sophomore standing or consent of instructor. 2 hours.
171. **Ceramics, II.** Advanced work in studio pottery, including expanded experience in forming methods and glaze compounds. Prerequisite: Crafts 170. 2 hours.
260. **Jewelry, III.** The design and production of jewelry and metal work for majors in crafts with further experience in manipulative techniques such as casting, electroforming, surface decoration, enamelling, complex construction and forming. Prerequisite: Crafts 160 and enrollment in the crafts curriculum. 3 hours.
261. **Jewelry, IV.** Expands the general techniques of Crafts 260 with emphasis on experimentation and development of personal style through advanced techniques of holloware, complex construction, enamelling, electroforming and plating, forging and the use of varied materials. Prerequisite: Crafts 260. 3 hours.
262. **Metal Technology.** Understanding of the working properties of a number of nonferrous metals, their alloys, and their patination; such areas as electroforming on organic and inorganic materials, working with rigid and thermosetting plastics, and experimentation with little known processes of metalwork to be subjects of individual research. Prerequisite: Junior standing in crafts or consent of instructor. 2 hours. May be repeated for a maximum of 4 hours.
264. **Jewelry, V.** Expands the general techniques of Crafts 260 with emphasis on experimentation and development of personal style and ability to work independently with regular faculty consultation. Prerequisite: Crafts 261. 5 hours.
265. **Jewelry, VI.** Continuation of Crafts 264; emphasis on experimentation and development of personal style, a portfolio, and a senior exhibition. Prerequisite: Crafts 264. 5 hours.
270. **Ceramics, III.** Introduction to ceramic design for developing basic skills in designing and producing clay products by various hand processes including throwing, handbuilding, and casting. Prerequisite: Junior standing in curriculum in crafts. 3 hours.
271. **Ceramics, IV.** Introduction to ceramic glaze calculation; concern with the understanding and application of the knowledge of glaze calculation in a creative way and with applications of creative experiments in glaze and clay bodies. Prerequisite: Crafts 270. 3 hours.
272. **Clay Technology.** An introduction to the nature and understanding of basic inorganic raw materials in relation to ceramic processes; laboratory testing of clay types, bodies, slips of earthenware, stoneware, and porcelain temperatures. Prerequisite: Junior standing in art and design or consent of instructor. 2 hours. May be repeated for a maximum of 4 hours.
274. **Ceramics, V.** The application of the combined skills of throwing and creative glaze procedures to produce thrown ceramic products with the emphasis on creative experimentation; also covers plaster and mold making as a creative procedure in producing clay products. Prerequisite: Crafts 271. 5 hours.
275. **Ceramics VI.** Technical and creative research in ceramic design, with emphasis on reappraisal of the traditional media and the traditional limited production method used by artist potters. Prerequisite: Crafts 274. 5 hours.
288. **Glass, I.** The design and production of glasswork by the offhand methods; work covers the basic processes of blowing and molding. Prerequisite: Industrial Design 134; junior standing in art or consent of instructor. 2 hours.
289. **Glass, II.** Advanced work in glassworking by the offhand methods including blowing, casting, fuming, and acid etching. Prerequisite: Crafts 288. 2 hours.
290. **Senior Honors in Crafts.** Independent creative activity, guided study, or research for honors. Prerequisite: Senior standing in crafts, a cumulative grade point average of 4.0; and consent of instructor, advisor, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
291. **Individual Crafts Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor,

- and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
- 354. **Glass.** Advanced glass design with emphasis on professional development and personal style. Prerequisite: Consent of instructor. 2 to 4 hours, or 1/2 to 1 unit.
 - 364. **Metal.** For graduate students not specializing in crafts; an additional creative experience for students who are aesthetically advanced in another medium. Prerequisite: Consent of instructor and associate head of department; open only to seniors and graduate students in art and design curricula other than crafts. 2 hours or 1/2 unit. May be repeated to a maximum of 2 units.
 - 374. **Ceramics.** Ceramic design with emphasis on the development of professional style and personal expression. Prerequisite: Consent of instructor. 2 to 4 hours, or 1/2 to 2 units. May be repeated to a total of 6 hours.
 - 491. **Special Problems in Crafts.** Directed individual creative activity or research. Prerequisite: Graduate standing in crafts. 1/2 to 2 units. May be repeated to a maximum of 5 units.
 - 498. **Ceramic-Glass-Metal Laboratory.** Individually directed research and personal expression in ceramic, glass, or metal medium. Prerequisite: Enrollment in the M.F.A. program with a major in ceramics, glass, or metal, or consent of departmental graduate committee. 1/2 to 2 units. May be repeated

Graphic Design

- 159. **Graphic Design: Basic Skills.** Basic production and presentation methods employed by the professional; study of contemporary methodology, drawing techniques, model making, and other processes unique to current professional demands. Prerequisite: Sophomore standing in graphic design curriculum or consent of instructor. To be taken concurrently with Graphic Design 161. 3 hours.
- 160. **Graphic Design: Production.** Basic information and current methods in the production of multiple printed communications, including printing processes, papermaking, binding and other practices, and the preparation of art work for the various methods of reproduction; field trips required. Prerequisite: Graphic Design 159. To be taken concurrently with Graphic Design 162. 3 hours.
- 161. **Graphic Design, I.** Introduction to the discipline and function of graphic design; considers the traditions and potentials of graphic design; and includes practical exercises in visual perception, visual organization, and visual communication. Prerequisite: Sophomore standing in graphic design curriculum or consent of instructor. To be taken concurrently with Graphic Design 159 except for students in the industrial design and medical art curricula. 3 hours.
- 162. **Graphic Design, II.** Introduction to the discipline, function, and tradition of the letter form as it relates to visual/verbal communication; considers both technical and formal aspects of typography. Prerequisite: Graphic Design 161 or consent of instructor. To be taken concurrently with Graphic Design 160 except for students in the industrial design and medical art curricula. 3 hours.
- 261. **Illustration, I.** The recognition, comprehension, and application of traditional and contemporary image-making techniques and styles; projects are designed to meet the criteria necessary for reproduction in the mass media. Prerequisite: Senior standing in graphic design and approval of the graphic design faculty. 3 hours.
- 264. **Photo/Graphics.** Experimentation into the design potential of photography in the lab, in the studio, and on location; a necessary preparation for collaboration with professional photographers. Prerequisite: Concurrent enrollment in Graphic Design 265 or 266. 3 hours.
- 265. **Graphic Design, III.** Visual communication problem solving on an applied level, both exploratory and practical; continued research into the literature of perception, visual signification, and symbology; primarily two-dimensional in emphasis. Prerequisite: Graphic Design 160 and 162, or consent of instructor. 3 hours.

266. **Graphic Design, IV.** Continuation of Graphic Design 265. Concerned primarily with sequential and three-dimensional graphics such as books, brochures, slides, film, videotape, packaging, and exhibition and display design. Prerequisite: Graphic Design 265. 3 hours.
267. **Graphic Design, V.** Research on, and analysis and synthesis of, complex visual problems; emphasis on modular sequence, symbolic systems, and image making for visual communication. Prerequisite: Graphic Design 266. 3 hours.
268. **Graphic Design, VI.** Continuation of Graphic Design 267. Preparation of a comprehensive portfolio and consideration of professional requirements encountered by the designer in the visual communications industry. Prerequisite: Graphic Design 267. 3 hours.
290. **Senior Honors in Graphic Design.** Independent creative activity, guided study, or research for honors. Prerequisite: Senior standing in graphic design, a cumulative grade point average of 4.0; and consent of instructor, advisor, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
291. **Individual Graphic Design Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
467. **Graphic Design Laboratory.** Individually directed research in the studio with concentration in graphic design. Prerequisite: Enrollment in the M.F.A. program in graphic design or consent of departmental graduate committee. 1/2 to 1 1/2 units. May be repeated to a maximum of 3 units.
491. **Special Problems in Graphic Design.** Directed individual creative activity or research. Prerequisite: Graduate standing in graphic design. 1/2 to 2 units. May be repeated to a maximum of 5 units

Industrial Design

133. **Design Workshop.** Fundamentals of three-dimensional design. Primarily for students majoring in the industrial design curriculum. Prerequisite: Freshman standing in art. 2 hours.
134. **Design Workshop.** Fundamentals of three-dimensional design. Primarily for students majoring in the industrial design curriculum. Prerequisite: Industrial Design 133. 2 hours.
175. **Design Management and Methods.** Introduction to comprehensive aspects of professional practice, including professional ethics, types of offices, general management roles, contacts and fees, work promotion, and project administration; lecture and discussion with one outside paper required. Prerequisite: Consent of instructor. 2 hours. May be repeated to a maximum of 4 hours.
210. **History of Furniture and Interior Design.** A historical study of furniture and interiors from the Renaissance to the present day; special emphasis upon the American development and the contemporary scene with reference to its technological and historical background. Prerequisite: Sophomore standing. 2 hours.
270. **Drawing and Rendering.** Quick delineation of industrial objects, interiors, and architecture; emphasis on drawing in perspective with color using pastels, markers, and other media. Prerequisite: General Professional Courses in Art and Design 122, or concurrent registration in General Professional Courses 122, or the equivalent in perspective drawing. 2 hours. May be repeated to a maximum of 4 hours.
271. **Materials and Processes, I.** Use and manipulation of basic materials in modern industry. Prerequisite: Junior standing in industrial design curriculum or consent of department. 3 hours.
272. **Materials and Processes, II.** Continuation of Industrial Design 271. Prerequisite: Industrial Design 271. 3 hours.

- 275. **Industrial Design, I.** Designing of objects for manufacture by the machine industries. Field trip required. Prerequisite: Junior standing in industrial design curriculum or consent of department. 3 hours.
- 276. **Industrial Design, II.** Continuation of Industrial Design 275. Field trip required. Prerequisite: Industrial Design 275. 3 hours.
- 277. **Advanced Industrial Design.** Prerequisite: Industrial Design 276. 5 hours.
- 278. **Advanced Industrial Design.** Prerequisite: Industrial Design 277. 5 hours.
- 290. **Senior Honors in Industrial Design.** Independent creative activity, guided study, or research for honors. Prerequisite: Senior standing in industrial design, a cumulative grade point average of 4.0; and consent of instructor, advisor, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
- 291. **Individual Industrial Design Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
- 477. **Industrial Design Laboratory.** Individually directed research in the drafting room or workshop with concentration on industrial design. Prerequisite: Enrollment in the M.F.A. program in industrial design or consent of departmental graduate committee. 1/2 to 3 units. May be repeated.
- 491. **Special Problems in Industrial Design.** Directed individual creative activity or design. Prerequisite: Graduate standing in industrial design. 1/2 to 2 units. May be repeated to a maximum of 8 units

Painting

- 125. **Life Drawing.** Prerequisite: General Professional Courses in Art and Design 118. 2 hours.
- 126. **Life Drawing.** Prerequisite: Painting 125. 2 hours.
- 129. **Anatomical Drawing, I.** Lecture and studio practice in the skeletal and muscular structure of the human figure. Prerequisite: General Professional Courses in Art and Design 118. 2 hours.
- 130. **Anatomical Drawing, II.** Continuation of Painting 129. Prerequisite: Painting 129. 2 hours.
- 141. **Beginning Painting, I.** Painting in oil from arranged groups. Prerequisite: Freshman standing in art. 2 hours.
- 142. **Beginning Painting, II.** Continuation of Painting 141. Prerequisite: Painting 141. 2 hours.
- 201. **Watercolor, I.** Prerequisite: General Professional Courses in Art and Design 118 and 120. 2 hours.
- 202. **Watercolor, II.** Continuation of Painting 201. Prerequisite: Painting 201. 2 hours.
- 225. **Intermediate Drawing.** Study from life in drawing media. Prerequisite: Painting 126 and junior standing in art. 2 hours.
- 226. **Intermediate Drawing.** Continuation of Painting 225. Prerequisite: Painting 225. 2 hours.
- 231. **Intermediate Composition.** Prerequisite: Painting 126 and 142 and General Professional Courses in Art and Design 132. 3 hours.
- 232. **Intermediate Composition.** Prerequisite: Painting 231. 3 hours.
- 233. **Advanced Composition.** Prerequisite: Painting 226, 232, and 244. 3 hours.
- 234. **Advanced Composition.** Prerequisite: Painting 233. 3 hours.
- 243. **Figure Painting.** Painting in oil from the head and full figure. Prerequisite: Painting 126 and 142. 2 hours.
- 244. **Figure Painting.** Continuation of Painting 243. Prerequisite: Painting 243. 2 hours.

- 245. Advanced Painting and Drawing.** Advanced creative study from nature and the model in various painting and drawing media. Prerequisite: Painting 226, 232, and 244. 3 hours.
- 246. Advanced Painting and Drawing.** Continuation of Painting 245. Prerequisite: Painting 245. 3 hours.
- 290. Senior Honors in Painting.** Independent creative activity, guided study, or research for honors. Prerequisite: Senior standing in painting, a cumulative grade point average of 4.0; and consent of instructor, advisor, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
- 291. Individual Painting Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
- 380. Drawing.** Advanced drawing in several media. Prerequisite: For undergraduates, consent of instructor; for graduates, consent of departmental graduate committee. 2 hours, or 1/2 to 1 unit.
- 381. Painting.** Advanced painting in oil and other media. Not open to candidates for the M.F.A. in painting. Prerequisite: For undergraduates, Painting 142 or equivalent; for graduates, consent of departmental graduate committee. 2 to 4 hours, or 1/2 to 1 unit. May be repeated to a total of 2 units.
- 382. Painting Materials and Techniques.** Study of the materials and techniques used in the various media: oil, watercolor, tempera, gouache, encaustic, etc. Prerequisite: Painting 142 or graduate standing in art. 2 hours or 1/2 unit.
- 491. Special Problems in Painting and Drawing.** Directed individual creative activity or research. Prerequisite: Graduate standing in painting. 1/2 to 2 units. May be repeated to a maximum of 5 units.
- 495. Painting Laboratory.** Professional and experimental painting with emphasis on the development of maturity of style and personal expression. Prerequisite: Enrollment in the M.F.A. program in painting. 1/2 to 3 units

Photography

- 115. Basic Photography.** Investigates basic elements comprising a photograph; explores the photogram, tone, and texture as expressive media; and works with the camera, exposure meter, and film and print developing in black and white. See Timetable for average cost; student must furnish camera. Prerequisite: Freshman standing in art and design, or consent of instructor. 3 hours.
- 215. Photography, II.** Uses hand held cameras (35mm and 2 1/4") and black and white processes to express ideas and emotions with emphasis on the development of a personal aesthetic. See Timetable for average cost; student must furnish camera. Prerequisite: Photography 115. 3 hours.
- 216. View Camera.** Includes work with camera movements, black and white exposure, and development relationships as tools of creative expression; most equipment furnished. Prerequisite: Photography 115. 3 hours.
- 220. Color Photography.** Explores the potential of color prints and transparencies as media for creative expression. See Timetable for average cost; student must furnish camera. Prerequisite: Photography 115. 3 hours.
- 230. Alternative Photographic Processes.** Explores cyanotype (blue printing), Van Dike, gumprinting, and other less common processes as methods of creative expression. Prerequisite: Photography 115. 3 hours.
- 291. Individual Photography Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
- 387. Photography.** Emphasis on development of mature creative attitudes through use of personal images and interpretations; work in black and white and in color.

Prerequisite: Any two of Photography 215, 216, 220, or 230, or equivalent; consent of instructor. 3 hours, or 1/2 to 1 unit. May be repeated.

398. **Photography Workshop.** An intensive course requiring full-time effort for a period of one to four weeks; see Timetable for topic. Prerequisite: Junior, Senior, or Graduate standing in art and design, or consent of instructor. 1 to 4 hours, or 1/4 to 1 unit. May be repeated as topics vary.
486. **Photography Studio.** Individually directed research; personal expression through the photographic medium. Prerequisite: Enrollment in M.F.A. program and major in photography/cinematography, or consent of the departmental graduate committee. 1/2 to 2 units. May be repeated for additional credit.
491. **Special Problems in Photography.** Directed individual creative activity or research. Prerequisite: Graduate standing in photography. 1/2 to 2 units. May be repeated to a maximum of 5 units

Printmaking

241. **Serigraphy (Screen Printing).** Traditional and contemporary methods of screen printing, equipment and materials, various methods of stencil preparation, and printing procedures and techniques; emphasizes creativity and print quality. Prerequisite: Junior standing in art and design. 3 hours.
271. **Etching.** A studio course in intaglio, including the complete development from sketch to printing stages. Prerequisite: Junior standing in art or consent of instructor. 2 hours.
272. **Etching.** A studio course in intaglio, including the complete development from sketch to printing stages. Prerequisite: Printmaking 271. 2 hours.
281. **Lithography.** A studio course in lithography comprised of black and white and multiple-color printing on both stones and metal plates; work includes complete development of a lithographic print from idea to the final print. Prerequisite: Junior standing in art or consent of instructor. 2 hours.
282. **Lithography.** A studio course in lithography comprised of black and white and multiple-color printing on both stones and metal plates; work includes complete development of a lithographic print from idea to the final print. Prerequisite: Printmaking 281. 2 hours.
291. **Individual Printmaking Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
371. **Etching.** Advanced work in various printmaking techniques. Not open to candidates for the M.F.A. in painting. Prerequisite: For undergraduates, Printmaking 272 or equivalent; for graduates, consent of departmental graduate committee. 2 hours, or 1/2 to 1 unit.
381. **Lithography.** Laboratory course in lithography. Course of study includes a complete development of the process, exploiting its potential as a fine art medium. Prerequisite: For undergraduates, Printmaking 282; for graduates, consent of departmental graduate committee. 2 hours, or 1/2 to 1 unit.
491. **Special Problems in Printmaking.** Directed individual creative activity or research. 1/2 to 2 units. May be repeated to a maximum of 5 units.
497. **Print Workshop.** Intaglio, relief, and planographic print media; includes etching, engraving, aquatint, wood, paper, and plastic relief printing, and lithography. Prerequisite: Graduate standing in art. 1/2 to 3 units

Sculpture

150. **Beginning Sculpture.** Clay modeling from the human figure; casting in plaster and other materials as well as production of sculpture involving materials other than plaster and clay. Not open to students majoring in art. 2 hours.
151. **Sculpture.** Anatomical and ornamental forms; plaster molds and models; and wood and stone sculpture. Prerequisite: Freshman standing in art. 2 hours.
152. **Sculpture.** Continuation of Sculpture 151. Prerequisite: Sculpture 151. 2 hours.
228. **Introduction to Handmade and Cast Paper.** Introduces the techniques of handmaking paper of various materials and of casting paper as sculpture, including molding techniques, investigations into various uses, and applications of the two techniques. 3 hours.
253. **Intermediate Sculpture, I.** A free, experimental, and creative use of permanent and impermanent sculpture materials; clays, wood, pastelines, and plasters. Prerequisite: Sculpture 152. 2 hours.
254. **Intermediate Sculpture, II.** Special projects in stone carving and malleable sheet metal; lead, copper, brass, and aluminum. Prerequisite: Sculpture 253. 2 hours.
255. **Sculpture Materials and Techniques, I.** Special projects for cast bronze; model preparations, investments, melting, pouring, chasing, and developing of patinas. Prerequisite: Sculpture 152; junior standing in curriculum in sculpture. 3 hours.
256. **Sculpture Materials and Techniques, II.** Special projects in terra cotta; use of various clays; preparation and construction methods; special problems in casting methods and materials; kiln operation; fuels; and glazing. Prerequisite: Sculpture 255. 3 hours.
257. **Advanced Sculpture, I.** Introduction to plastics and welded metals; projects utilizing the special qualities of these materials. Prerequisite: Sculpture 254. 2 hours.
258. **Advanced Sculpture, II.** Projects in permanent materials; special attention given to the relation of sculpture to the allied fields of architecture and landscape architecture. Prerequisite: Sculpture 257. 2 hours.
259. **Advanced Sculpture Materials and Techniques, I.** Projects in various permanent materials; special attention given to the relation of sculpture to the allied fields of architecture and landscape architecture. Prerequisite: Sculpture 256. 3 hours.
260. **Advanced Sculpture Materials and Techniques, II.** Continuation of Sculpture 259. Prerequisite: Sculpture 259. 3 hours.
290. **Senior Honors in Sculpture.** Independent creative activity, guided study, or research for honors. Prerequisite: Senior standing in sculpture, a cumulative grade point average of 4.0; and consent of instructor, advisor, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
291. **Individual Sculpture Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
391. **Advanced Sculpture Techniques.** Advanced work in various sculptural media. Prerequisite: Consent of instructor. 2 hours, or 1/2 to 1 unit.
491. **Special Problems in Sculpture.** Directed individual creative activity or research. Prerequisite: Graduate standing in sculpture. 1/2 to 2 units. May be repeated to a maximum of 5 units.
496. **Sculpture Laboratory.** Experience at a professional level in sculptural techniques including metals casting, welding, stone carving, wood carving, clay modeling, and ceramic sculpture, with emphasis on the development of creative achievement. Prerequisite: Enrollment in the M.F.A. program in sculpture or consent of departmental graduate committee. 1 to 3 units

ART EDUCATION

(See Art and Design)

ASIAN STUDIES

(Including Chinese, Japanese, Korean, and Sanskrit)

Director of Center: Professor P. Schran

Center Office: Room 201, 1208 West California Avenue, Urbana

All 200-level language courses, Chinese 301 and 302, and Japanese 301 and 302 are open to freshmen.

Asian Studies

- 104. **Asian Mythology.** Same as Religious Studies 104. See Religious Studies 104.
- 122. **History of East Asian Religions.** Same as Religious Studies 122. See Religious Studies 122.
- 150. **Introduction to Japanese Culture.** Same as Japanese 150. See Japanese 150.
- 175. **Masterpieces of East Asian Literature.** Same as Chinese 175, Japanese 175, and Comparative Literature 175. Study of major works in the literary traditions of China and Japan, including haiku, Noh, Tale of Genji, kabuki, Tang poetry, Dream of the Red Chamber, Ming theatre, and the colloquial tale. No knowledge of Chinese or Japanese language required. 3 hours.
- 185. **Kabuki.** Same as Fine and Applied Arts 185. See Fine and Applied Arts 185.
- 186. **Southeast Asian Civilizations.** Same as Anthropology 186. See Anthropology 186.
- 199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 205. **Japanese Literature in Translation, I.** Same as Comparative Literature 211 and Japanese 205. See Japanese 205.
- 206. **Japanese Literature in Translation, II.** Same as Comparative Literature 212 and Japanese 206. See Japanese 206.
- 207. **Chinese Literature in Translation, I.** Same as Chinese 207 and Comparative Literature 213. See Chinese 207.
- 208. **Chinese Literature in Translation, II.** Same as Chinese 208 and Comparative Literature 214. See Chinese 208.
- 209. **Chinese Thought, I.** Same as Chinese 209. See Chinese 209.
- 210. **Chinese Thought, II.** Same as Chinese 210. See Chinese 210.
- 218. **Japanese Hero Types.** Same as Comparative Literature and Japanese 218. See Japanese 218.
- 219. **Women in Japanese Literature.** Same as Comparative Literature and Japanese 219. See Japanese 219.
- 261. **Family and Community in China and Japan.** An introduction to Chinese and Japanese societies at the family, village, and city levels; examines traditional marriage, child-rearing, women's roles, farming, and community leadership as well as modern trends in these areas using a variety of documentary, fictional, and visual sources. 3 hours.
- 262. **Popular Culture in China and Japan.** An introduction to the popular cultural traditions of China and Japan; examines popular morality, cosmology, religion, secret societies, the "way of the samurai," body and health (acupuncture, meditation, Zen, T'ai- chi chuan), aesthetics (poetry, painting, tea ceremony), and the world of the courtesan using a variety of documentary, fictional, and visual sources. 3 hours.
- 263. **Inequality and Power in Contemporary China.** Same as Sociology 263. See Sociology 263.

290. **Individual Study.** Directed readings in the languages and literatures of East Asia, South Asia, Southeast Asia, or the Near East. The area selected depends on the student's interest. Prerequisite: Consent of instructor. 2 to 4 hours.
291. **Honors Tutorial.** A tutorial in the civilizations of East Asia, South Asia, Southeast Asia, or the Near East. The geographical area or nation and discipline depend on student interests. All students submit a substantial paper. Prerequisite: Prior completion of two honors activities, prior completion of work in Asian studies, and consent of instructor. 2 to 4 hours. May be repeated to a maximum of 6 hours.
295. **Topics in Asian Religions.** Same as Religious Studies 295. See Religious Studies 295.
298. **Colloquium in Asian Studies.** 3 hours.
303. **Japanese Society.** Same as Sociology 327. See Sociology 327.
311. **The Chinese Novel.** Same as Chinese and Comparative Literature 311. See Chinese 311.
312. **Modern Chinese Literature in Translation.** Same as Chinese and Comparative Literature 312. See Chinese 312.
328. **Sociology of Asian Religions.** Same as Religious Studies and Sociology 328. See Sociology 328.
337. **Government and Politics of China.** Same as Political Science 337. See Political Science 337.
338. **Governments and Politics in the Middle East.** Same as Political Science 338. See Political Science 338.
345. **Tutorials in East and Southeast Asian Languages.** Tutorials at the elementary, intermediate, and advanced levels in special Asian languages not regularly offered are available with the consent of the director of the Center for Asian Studies. May be repeated up to six semesters successively, but no more than 4 units of graduate credit may be accumulated in any one language. Graduate credit is given only for work beyond the elementary level. Prerequisite: Consent of director of the Center for Asian Studies. 5 hours or 1 unit.
347. **Governments and Politics of Southeast Asia.** Same as Political Science 347. See Political Science 347.
348. **Government and Politics of Japan.** Same as Political Science 348. See Political Science 348.
349. **Governments and Politics of South Asia.** Same as Political Science 349. See Political Science 349.
350. **East Asian Bibliography and Research Methods.** Introduces research methods and reference works for East Asian studies through practical exercises and assignments. Students registering for 2 hours or 1/2 unit (Part I) use only Western sources; students registering for 4 hours or 1 unit (Parts I and II) use Chinese or Japanese sources for the second part of the course. Prerequisite: (Part II) Chinese 204 or Japanese 204; Part I requires no prerequisite. 2 or 4 hours, or 1/2 or 1 unit.
355. **Chinese Society.** Same as Sociology 355. See Sociology 355.
360. **Peoples and Cultures of Oceania.** Same as Anthropology 360. See Anthropology 360.
362. **Asian Prehistory.** Same as Anthropology 362. See Anthropology 362.
368. **Peoples and Cultures of India.** Same as Anthropology 368. See Anthropology 368.
383. **Self and Society in Japan.** Same as Anthropology 383. See Anthropology 383.
385. **Chinese Foreign Policy.** Same as Political Science 389. See Political Science 389.
386. **Peoples and Cultures of Mainland Southeast Asia.** Same as Anthropology 386. See Anthropology 386.
387. **Peoples and Cultures of Insular Southeast Asia.** Same as Anthropology 387. See Anthropology 387.
388. **Prehistory of Oceania.** Same as Anthropology 388. See Anthropology 388.
437. **Problems in Chinese Politics and Government.** Same as Political Science 437. See Political Science 437.
448. **Problems in Japanese Politics and Government.** Same as Political Science 448. See Political Science 448.

450. **Seminar in Asian Studies.** Seminar on selected Asian and Middle Eastern topics. The topic will vary with the instructor and the seminar may be repeated for a maximum of 3 units. Prerequisite: Consent of instructor. 1 unit.
490. **Individual Study and Research in Special Topics.** Supervised individual investigation or study of a topic not covered by regular course offerings. The topic selected by the student and the proposed plan of study must be approved by the Asian studies curriculum adviser and the staff member who supervises the work. Prerequisite: Consent of instructor. 1/2 to 3 units

Chinese

101. **Elementary Chinese, I.** An introduction to Mandarin Chinese, including conversation with a native Chinese-speaking tutor under the direction of a linguist-instructor, and a minimum of formal grammar and writing. 5 hours.
102. **Elementary Chinese, II.** Second term of spoken Mandarin Chinese, including conversation with a native Chinese-speaking tutor under the direction of a linguist-instructor; formal grammar based on conversational materials; and work on written Chinese. Prerequisite: Chinese 101. 5 hours.
175. **Masterpieces of East Asian Literature.** Same as Asian Studies 175, Japanese 175, and Comparative Literature 175. See Asian Studies 175.
203. **Intermediate Chinese, I.** First term of second year of the Chinese language, including drill for more advanced conversational fluency; introduction to a greater variety of styles and levels of discourse and usage; and increasing study of the written language and more formal grammar. Prerequisite: Chinese 102 or 301, or equivalent. 5 hours.
204. **Intermediate Chinese, II.** Concentration on ability to engage in fluent discourse, on comprehensive grammatical knowledge, and on ability to read ordinary simple text in Chinese. Prerequisite: Chinese 203 or equivalent. 5 hours.
207. **Chinese Literature in Translation, I.** Same as Asian Studies 207 and Comparative Literature 213. An introductory survey of Chinese literature and its cultural and historical background from earliest times to the end of the T'ang. No knowledge of Chinese is required. 3 hours.
208. **Chinese Literature in Translation, II.** Same as Asian Studies 208 and Comparative Literature 214. An introductory survey of Chinese literature and its cultural and historical background from the end of the T'ang to the present. No knowledge of Chinese is required. Prerequisite: Chinese 207 or consent of instructor. 3 hours.
209. **Chinese Thought, I.** Same as Asian Studies 209. A survey of early Chinese thought before the introduction of Buddhism with emphasis on Confucianism and Taoism. No knowledge of Chinese required. 3 hours.
210. **Chinese Thought, II.** Same as Asian Studies 210. Survey of Chinese thought since the introduction of Buddhism with emphasis on Buddhism, Neo-Confucianism, and the impact of the West. No knowledge of Chinese required. 3 hours.
211. **Chinese Calligraphy.** Brief history of Chinese calligraphy; practice of regular and grass forms with Chinese brush pens. Prerequisite: Chinese 102 or equivalent. 1 hour.
301. **Intensive Chinese, I.** Intensive introduction to the spoken and written Chinese language; emphasizes the introduction of basic vocabulary and sentence patterns. This course is equivalent to Chinese 101 and 102. For all students who have no previous Chinese and who want to learn at a rapid rate. 10 hours or 2 units.
302. **Intensive Chinese, II.** Continuation of Chinese 301. Emphasizes conversation and reading. This course is equivalent to Chinese 203 and 204. Prerequisite: Chinese 102 or 301, or equivalent. 10 hours or 2 units.
303. **Advanced Chinese, I.** Continuation of intermediate-level Chinese with emphasis on rapid reading, vocabulary acquisition, and newspaper reading. Prerequisite: Chinese 204 or 302. 5 hours or 1 unit.

304. **Advanced Chinese, II.** Continuation of Chinese 303 with emphasis on rapid reading, vocabulary acquisition, and newspaper reading. Prerequisite: Chinese 303. 5 hours or 1 unit.
305. **Advanced Readings in Modern Chinese, I.** Reading and translation of graded selections from modern Chinese literary and journalistic writing. Prerequisite: Three years of modern Chinese. 3 hours or 1 unit.
306. **Readings in Modern Chinese, II.** Reading in modern Chinese literary and journalistic writings; introduction to classical Chinese to prepare students of modern Chinese to understand classical forms and quotations in vernacular text and to use dictionaries and reference works. Prerequisite: Chinese 305 or equivalent. 3 hours or 1 unit.
307. **Introduction to Literary Chinese.** An introduction to literary language, style, and structural patterns as reflected in the Confucian classics and other literary, philosophical, and historical texts. Prerequisite: Chinese 306 or equivalent. 3 hours or 1 unit.
308. **Readings in Literary Chinese.** Readings in texts selected from the Confucian classics and other literary, philosophical, and historical texts. Attention is given to linguistic and intellectual patterns and to problems of translation. Prerequisite: Chinese 307 or equivalent. 3 hours or 1 unit. May be repeated for a maximum of 9 hours or 3 units.
309. **Social Science Readings in Chinese.** Reading and translation of selected Chinese texts in the social sciences with emphasis on specialized terminology and prose style. Prerequisite: Three years of modern Chinese. 3 hours or 1 unit. May be repeated for a maximum of 9 hours or 3 units.
311. **The Chinese Novel.** Same as Asian Studies and Comparative Literature 311. Reading and analysis of representative pieces of Chinese fiction from the fourth century B.C. to 1900 with emphasis on the development of Chinese fiction, its place in the literary tradition, and its role in society. No knowledge of Chinese is required. 3 hours or 1 unit.
312. **Modern Chinese Literature in Translation.** Same as Asian Studies and Comparative Literature 312. Reading and analysis of representative selections from Chinese literature since the May 4 Movement, with special attention to the relationship between literature and ideology in twentieth-century China. No knowledge of Chinese is required. 3 hours or 1 unit.
315. **Introduction to Colloquial Chinese Literature.** Reading and close analysis of colloquial texts selected from Chinese literature. Prerequisite: Chinese 306 or equivalent. 3 hours or 1 unit.
317. **Introduction to Classical Chinese Literature.** Reading and analysis of classical texts selected from Chinese literature; emphasis on poetry and artistic prose. Prerequisite: Chinese 315 or 307. 3 hours or 1 unit.
321. **Oral Chinese, I.** Conversational practice for the development of oral facility with emphasis on contemporary usage. Prerequisite: Chinese 204 or 302, or equivalent. 3 hours or 1 unit.
322. **Oral Chinese, II.** Conversational practice for the development of oral facility with emphasis on contemporary usage. Prerequisite: Chinese 321 or consent of instructor. 3 hours or 1 unit.
330. **Introduction to Far Eastern Linguistics.** Same as Japanese, Korean, and Linguistics 330. See Linguistics 330.
390. **Readings in East Asian Literature.** Guided readings in an East Asian literature in the vernacular with regular individual conferences and a paper. Prerequisite: Reading knowledge of an East Asian language and consent of instructor. 3 hours or 1 unit. May be repeated for a maximum of 6 hours or 2 units.
399. **Study Abroad.** Lectures, seminars, and practical work in Chinese language, literature, and civilization and in other academic areas appropriate to the student's course of study. Prerequisite: Junior standing and a grade point average of 3.5. 0 credit

Japanese

101. **Elementary Japanese, I.** An introduction to Japanese, including conversation with a native Japanese-speaking tutor under the direction of the linguist-instructor, and a minimum of formal grammar and writing. 5 hours.
102. **Elementary Japanese, II.** Second term of spoken Japanese, including conversation with a native Japanese-speaking tutor under the direction of a linguist-instructor; formal grammar based on conversational materials; and work on written Japanese. Prerequisite: Japanese 101. 5 hours.
150. **Introduction to Japanese Culture.** Same as Asian Studies 150. A topical introduction to Japanese cultural and aesthetic life with attention to cultural and aesthetic patterns as they are reflected in literature, language, and the arts. 3 hours.
175. **Masterpieces of East Asian Literature.** Same as Asian Studies 175, Chinese 175 and Comparative Literature 175. See Asian Studies 175.
203. **Intermediate Japanese, I.** First term of second year of the Japanese language, including drill for more advanced conversational fluency; introduction to a greater variety of styles and levels of discourse and usage; and increasing study of the written language and more formal grammar. Prerequisite: Japanese 102 or 301, or equivalent. 5 hours.
204. **Intermediate Japanese, II.** Concentration on ability to engage in reasonably fluent discourse in Japanese, on comprehensive views of formal grammar, and on ability to read simple ordinary written Japanese. Prerequisite: Japanese 203 or equivalent. 5 hours.
205. **Japanese Literature in Translation, I.** Same as Asian Studies 205 and Comparative Literature 211. A survey of Japanese literature from earliest times to around 1600 A.D.; readings in prose, poetry, and drama in English translation. 3 hours.
206. **Japanese Literature in Translation, II.** Same as Asian Studies 206 and Comparative Literature 212. A survey of Japanese literature from around 1600 A.D. to recent times; readings in prose, poetry, and drama in English translation; and lectures and papers. 3 hours.
218. **Japanese Hero Types.** Same as Asian Studies and Comparative Literature 218. Analyzes Japanese hero and heroine archetypes in comparison with their Western counterparts: from shaman ruler, Don Juan, samurai romantics, feudal paragons, to modern superfluous hero and self-destructive hollow man; no knowledge of Japanese required. Discussion with readings and films. 3 hours.
219. **Women in Japanese Literature.** Same as Asian Studies and Comparative Literature 219. Critically studies Japanese women's history as represented in literature, emphasizing religio- social-literary significance, male view of women, female roles, and universal experience of growing up female; no knowledge of Japanese required. Readings and discussion. 3 hours.
299. **Study Abroad.** Lectures, seminars, and practical work in the Japanese language, literature, and civilization, and in other academic areas appropriate to the student's course of study. Prerequisite: Junior standing and a grade point average of 3.50. 0 to 16 hours per semester, to a maximum of 32 hours per academic year.
301. **Intensive Japanese, I.** An intensive introduction to spoken and written Japanese; emphasis on basic grammatical patterns and vocabulary. Equivalent to Japanese 101 and 102; for students who have no previous Japanese and who want to learn at a rapid rate. 10 hours or 2 units.
302. **Intensive Japanese, II.** Continuation of Japanese 301. Emphasis on conversation and reading. Equivalent to Japanese 203 and 204. Prerequisite: Japanese 102 or 301, or equivalent. 10 hours or 2 units.
303. **Oral Japanese, I.** Conversational practice for the development of oral facility with emphasis on contemporary usage. Prerequisite: Japanese 204 or 302, or consent of instructor. 3 hours or 1 unit.

- 304. **Oral Japanese, II.** Conversational practice for the development of oral facility with emphasis on contemporary usage. Prerequisite: Japanese 303 or consent of instructor. 3 hours or 1 unit.
- 305. **Readings in Modern Japanese, I.** Reading and translation of selected texts in modern Japanese. Prerequisite: Two years of Japanese. 3 hours or 1 unit.
- 306. **Readings in Modern Japanese, II.** Continuation of Japanese 305. Reading and translation of selected texts in modern Japanese. Prerequisite: Japanese 305 or equivalent. 3 hours or 1 unit.
- 309. **Social Science Readings in Japanese.** Readings in Japanese social science materials, including articles from newspapers, periodicals, and learned journals. Prerequisite: Japanese 306 or equivalent. 3 hours or 1 unit. May be repeated for a maximum of 9 hours or 3 units.
- 310. **Modern Japanese Literature.** Reading and analysis of selected Japanese texts, primarily fiction. Prerequisite: Japanese 306 or equivalent. 3 hours or 1 unit.
- 330. **Introduction to Far Eastern Linguistics.** Same as Chinese, Korean, and Linguistics 330. See Linguistics 330.
- 390. **Readings in East Asian Literature.** Guided readings in an East Asian literature in the vernacular with regular individual conferences and a paper. Prerequisite: Reading knowledge of an East Asian language and consent of instructor. 3 hours or 1 unit. May be repeated for a maximum of 6 hours or 2 units

Korean

- 330. **Introduction to Far Eastern Linguistics.** Same as Chinese, Japanese, and Linguistics 330. See Linguistics 330

Sanskrit

- 201. **Elementary Sanskrit, I.** Introduction to Sanskrit, treating in full the grammar of the language as preparation for reading, and including the reading of sections of the Mahabharata. 5 hours.
- 202. **Elementary Sanskrit, II.** Continuation of Sanskrit 201. Prerequisite: Sanskrit 201. 5 hours.
- 309. **Introduction to Sanskrit Literature in English Translation.** Same as Comparative Literature 309. Focus on different forms of Sanskrit literature in English translation with emphasis on drama, poetry, and poetics. 3 hours or 1 unit

ASTRONOMY

Head of Department: Professor I. Iben, Jr.

Department Office: 341 Astronomy Building, 1011 W. Springfield, Urbana

- 100. **Perspectives in Astronomy.** A one-semester introduction to astronomy. The nature of science; sun, planets, and moons; origin of the solar system; nature and evolution of stars; exploding stars; stellar remnants, including dwarfs, neutron stars, and black holes; molecules in space; galaxies and quasars; past and future of the universe; and life in the universe. Lectures and observation. Credit is not given to students with credit in Astronomy 101, 102, or 300; not open to students with credit in Physics 102, 107, or equivalent. 3 hours.
- 101. **Descriptive Astronomy.** The first semester of a two-semester introduction to astronomy. Introductory survey of the universe; structure and motions of the earth and moon; planetary motions; physical nature of the planets; comets and meteors; and

- origin and evolution of the solar system. Lectures, discussion, and observation. Credit is not given to students with credit in Astronomy 100, 210, or 300; not open to students who have credit in Physics 102, 107, or equivalent. 4 hours.
102. **Descriptive Astronomy.** The stars: distances, motions, and dimensions; atoms and radiation; structure, origin, and evolution of stars; structure of the Milky Way; and galaxies and the structure of the universe. Lectures, discussion, and observation. Credit is not given to students with credit in Astronomy 100, 210, or 300. Prerequisite: Astronomy 101. 4 hours.
140. **Thought and Structure in Physical Science.** An approach to the structure of Scientific theories using some of the subject matter of descriptive astronomy and physics; emphasis on the nature of scientific thinking and the criteria for the validity of scientific ideas. Lecture, laboratory, and discussion. 4 hours.
141. **The Physical Universe.** Study of the various forms of universal energy, using some of the subject matter of cosmology and modern physics; emphasis on such items as man's ability to measure very far distances and to interpret the evidence for the origin of the solar system and of the universe. 4 hours.
197. **Freshman Seminar in Physical Science.** A history of scientific discovery emphasizing the way in which crucial experiments of physical scientists from Galileo to Faraday have supported new scientific concepts and theories; discussion, individual research, and reports; and laboratory work replicating significant experiments. Prerequisite: James Scholar or designation as a superior student; consent of instructor. 4 hours.
198. **Freshman Seminar in Physical Science.** A history of scientific discovery emphasizing the way in which crucial experiments of physical scientists from Maxwell to modern times have supported new scientific concepts and theories; discussion, individual research, and reports; and laboratory work replicating significant experiments. Prerequisite: Astronomy 197 or consent of instructor. 4 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
210. **General Astronomy.** A survey of astronomy for students having some background in physics. The approach is primarily descriptive, but mathematical techniques are used where needed. The chief topics are orbits and gravitation; the bodies of the solar system; the nature and evolution of the stars; galaxies; and the structure of the universe. Credit is not given to students who have credit in Astronomy 101, 102, or 300. Prerequisite: Physics 102, 107, or equivalent. 3 hours.
290. **Individual Study.** Individual study at an advanced undergraduate level. Prerequisite: Consent of adviser and of staff member who supervises the work. 2 to 4 hours.
300. **Astronomy for Teachers.** A general course in astronomy designed for teachers which includes classical astronomy, modern developments, and aspects of the space program; discussion of available curriculum materials for elementary and secondary teaching and some practice given in telescopic observation. Credit is not given to students with credit in Astronomy 101, 102, or 210, or to astronomy majors. Graduate credit is given only to students in elementary and secondary teacher training programs. 4 hours or 1 unit.
304. **Astrophysics, I.** Introduction to astrophysical problems, with emphasis on underlying physical principles; includes the nature of stars, equations of state, stellar energy generation, stellar structure and evolution, astrophysical neutrinos, binary stars, white dwarfs, neutron stars and pulsars, and novae and supernovae. Prerequisite: Physics 108. 3 hours or 1 unit.
305. **Astrophysics, II.** Introduction to astrophysical problems; includes fundamentals of solar system astrophysics, elements of physical cosmology, and such additional topics as galactic nuclei, quasars, cosmic ray nuclei, the interstellar medium, and cosmic electrodynamics. Prerequisite: Astronomy 304. 3 hours or 1 unit.
314. **Observational Astronomy.** Introduction to astronomical equipment; optical photography and radio mapping; astronomical coordinate systems and transformations; determination of latitude, longitude, and time; and introduction to

- error theory and applications. Practical experience with the 12-inch refractor and 120-foot radio telescope. Lectures and laboratory. Prerequisite: Astronomy 102 or 210; Mathematics 240, 241, or 245. 4 hours or 1 unit.
- 315. Observational Techniques and Reductions.** Methods of observation and reduction in optical and radio wavelength regions, photographic and photoelectric photometry, spectrophotometry, optical and radio line profiles; radial velocity determinations; stellar diameters from lunar occultations; and pulsar timing. Practical experience with the 40-inch reflector and 120-foot radio telescope. Lectures and laboratory. Prerequisite: Astronomy 314. 4 hours or 1 unit.
- 321. Stellar Systems, I.** Galactic structure: the observational data; stars in the solar neighborhood; the solar motion; stellar statistics and distribution; stellar populations; interstellar matter and spiral structure; and the whole galaxy. Prerequisite: Astronomy 102 or 210; Physics 108. 3 hours or 1 unit.
- 322. Stellar Systems, II.** Continuation of Astronomy 321. Galactic dynamics: stellar motions; galactic rotation; dynamics and mass distribution; stellar encounters; and dynamics of interstellar matter. Galaxies: distances; structural features; groups and clusters; radio galaxies and quasars; and spatial distribution and motions. Prerequisite: Astronomy 321. 3 hours or 1 unit.
- 380. Radiative Processes in Astrophysics.** Introduction to graduate-level astrophysics courses; includes interactions between radiation and matter under astrophysical conditions, atomic and molecular spectra in astrophysics, and introduction to fundamental processes in stellar atmospheres and interstellar space. Prerequisite: Physics 386 or equivalent; credit or registration in Physics 387. 3 hours or 1 unit.
- 396. Seminar in Astronomy.** Lectures on topics of current interest in astronomy and astrophysics; for advanced undergraduates and graduates. See Timetable for current topics. Prerequisite: Consent of instructor. 2 to 4 hours, or 1/2 to 1 unit.
- 401. Stellar Atmospheres.** Physical characteristics of stellar atmospheres as derived from spectroscopic observations; radiation transfer; theory and observations of the continuous spectrum; limb darkening; formation of absorption lines; line profiles; curves of growth; relative chemical abundances; and emission features. Prerequisite: Consent of instructor. Desirable background includes some familiarity with atomic physics, advanced calculus, and general astronomy. 1 unit.
- 402. Theoretical Astrophysics.** Same as Physics 402. See Physics 402.
- 403. Gaseous Nebulae and the Interstellar Medium.** Distribution, structure, and spectra of nebulae; physical processes in planetary and diffuse nebulae; recombination, fluorescence, and forbidden line radiation; determination of physical parameters; nature of the interstellar medium; interstellar gas and grains; and observation of interstellar medium. Prerequisite: Astronomy 380. 1 unit.
- 404. Stellar Structure and Evolution.** Same as Physics 404. Relationship between observable features of stars and the physical processes that occur in their interiors; topics include matter and radiation in stars (equations of state, modes of energy flow, nuclear energy production, and element synthesis); structure of stars during all phases prior to the supernova or planetary nebula stage; stellar pulsations with reference to Cepheids and RR Lyrae variables; and properties of white dwarfs, neutron stars, and contact binaries. Prerequisite: Physics 361 and 382, Physics/Astronomy 402, or consent of instructor. 1 unit.
- 405. Theory of the Interstellar Medium.** Same as Physics 405. See Physics 405.
- 406. Nuclear Astrophysics.** Same as Physics 406. Survey of nuclear processes in astrophysical environments; topics include nuclear energy generation, thermonuclear reactions, weak interactions and neutrino astrophysics, nucleosynthesis, superheavy nuclei, cosmochronology, and mechanisms of nova and supernova explosions. Prerequisite: Physics 402 or consent of instructor. 1 unit.
- 424. General Relativity and Cosmology.** Same as Mathematics 460 and Physics 424. See Physics 424.
- 433. Solar System Astrophysics.** Planetary orbits and perturbations; physical perturbations; physical parameters of the planets; planetary interiors, atmospheres, magnetospheres, and surface layers; the satellites; asteroids and comets; meteors,

meteorites, and tektites; interplanetary grains and gas; and problems of origin and evolution. Prerequisite: Consent of instructor. 1 unit.

- 490. **Individual Study.** Individual study or nonthesis research. Prerequisite: Consent of adviser and of staff member who supervises the work. 1/2 to 2 units. May be repeated to a maximum of 4 units.
- 496. **Seminar in Special Topics.** Prerequisite: Consent of instructor. 0 to 4 units.
- 499. **Thesis Research.** 0 to 4 units

ATMOSPHERIC SCIENCES

Director of Laboratory: Professor Y. Ogura

Laboratory Office: 6-113 Coordinated Science Laboratory, 1101 West Springfield, Urbana

- 100. **Introductory Weather Forecasting.** Introduces the physical basis of weather forecasting and the techniques used in practical weather forecasting; supplements classroom lectures with map exercises and preparation of real-time weather forecasts. 3 hours.
- 222. **Weather Processes.** Introduction to the mean state of the atmosphere, the fundamental physics of weather processes, and the mechanisms producing daily weather changes, both qualitative and quantitative in nature. Prerequisite: Mathematics 241. 3 hours.
- 301. **Principles of Atmospheric Physics.** Quantitative introduction to atmospheric thermodynamics, cloud physics, and radiative transfer; topics include the structure, stability, and energy balance of the atmosphere and the formation of clouds and precipitation. Prerequisite: Mathematics 240, 241, or 245; consent of instructor. 4 hours or 1 unit.
- 302. **Principles of Atmospheric Dynamics.** Same as Physics 302. An introduction to those elements of fluid dynamics and thermodynamics essential to understanding the large- and small-scale motions of neutral atmosphere. Prerequisite: Mathematics 343; consent of instructor. 4 hours or 1 unit.
- 310. **Satellite Meteorology.** Reviews the theory and practice of observing the atmosphere using satellite-borne instrumentation; applications include weather analysis and forecasting using visible and infrared images, and the measurement of basic atmospheric variables such as temperature, moisture, wind, and precipitation. Prerequisite: Atmospheric Sciences 222 or 301; or equivalent. 3 hours, or 3/4 or 1 unit.
- 397. **Topics in Atmospheric Sciences.** Special topics in atmospheric sciences at an advanced undergraduate level. Prerequisite: Advanced undergraduate standing and consent of instructor. 2 to 4 hours, or 1/2 to 1 unit.
- 401. **Weather Analysis.** Describes the workings of the real atmosphere by giving the student practical experience in weather analysis, with emphasis on physical interpretation; also reviews the methods and procedures of weather analysis by numerical processes, in particular methods of deducing vertical motions. Prerequisite: Atmospheric Sciences 301 and 302. 1 unit.
- 405. **Numerical Methods in Fluid Dynamics.** Same as Computer Science 405. Intended to give the student practical numerical techniques for solving those linear and nonlinear differential equations which appear frequently as initial and boundary value problems in hydrodynamics and dynamic meteorology. Prerequisite: Mathematics 343 or consent of instructor. 1 unit.
- 406. **Dynamical Weather Prediction.** Intended to describe the principles and methods of simulating and predicting large-scale atmospheric motions on the basis of hydrodynamics and thermodynamics. Prerequisite: Atmospheric Sciences 302. 1 unit.
- 408. **Atmospheric General Circulation.** Reviews the observed general circulation of the earth's atmosphere; discusses the balance requirements of mass, momentum, and energy conservation; illustrates, by means of different mathematical modelings and

laboratory physical modeling, the important processes which determine the earth's and other planets' general circulation; and considers theories of climatic changes. Prerequisite: Atmospheric Sciences 301 or equivalent, and Atmospheric Sciences 302. 1 unit.

411. **Atmospheric Convection.** Atmospheric convection processes from the classical Benard-Rayleigh theory of convection to the structure and dynamics of isolated clouds, organized cloud systems, and ensembles of cumulus clouds; interactions of cumulus clouds with their environment. Prerequisite: Atmospheric Sciences 301 and 302. 1 unit.
421. **Precipitation Physics.** Develops an understanding of precipitation processes through cloud observations, microphysics, dynamics, and comprehensive theoretical models; includes growth by condensation, coalescence, and riming; and studies ice crystals, hail, and weather modification. Prerequisite: Atmospheric Sciences 301. 1 unit.
431. **Boundary Layer Meteorology.** Comprehensive review of processes in the lowest layer of the atmosphere based on the statistical mechanics of turbulent motions; emphasizes the effects of earth's rotation, mean wind shear, stratification, thermal stability, interaction with the free atmosphere, and surface roughness; and includes applications for the numerical prediction of diurnal changes of the boundary layer structure, transports of momentum, heat, and moisture and pollution dispersion. Prerequisite: Atmospheric Sciences 302, Theoretical and Applied Mechanics 335, or equivalent. 1 unit.
441. **Dynamics of Climate and Climate Change.** Global aspects of climate and climate change; empirical studies of the observed climate system; the heat budget, general circulation of the atmosphere, role of oceans and cryosphere, interannual variability, and causes of climate change; climate modeling; and long range forecasting and possible future trends. Prerequisite: Atmospheric Sciences 301 and 302, or consent of instructor. 1 unit.
451. **Atmospheric Radiation.** Physical concepts and various methods of analysis of radiation scattering by atmospheric molecules, particulates, and clouds; infrared radiative transfer in a stratified inhomogeneous atmosphere; radiation and ozone photochemistry in the stratosphere; and remote temperature and composition sensing techniques using satellite radiation data. Prerequisite: Atmospheric Sciences 301 or Astronomy 380. 1 unit.
490. **Individual Study.** Individual study or reading in a subject not covered in normal course offerings. Prerequisite: Consent of instructor. 1/2 to 2 units.
491. **Seminar in Atmospheric Sciences.** Seminar on topics of current interest; see Timetable for current topics. Prerequisite: Consent of instructor. 0 to 1 unit.
497. **Special Topics in Atmospheric Sciences.** Lecture course in topics of current interest; subjects such as oceanic circulation, physical meteorology, upper atmosphere dynamics, atmospheric convection, atmospheric turbulence and boundary layers, dynamic oceanography, and advanced topics in atmospheric dynamics will be covered in semester offerings on a regular basis. Prerequisite: Consent of instructor. 0 to 1 unit.
499. **Thesis Research.** Section A, for master's degree candidates; Section B, for doctoral degree candidates. Prerequisite: Consent of instructor. 0 to 4 units

AVIATION

Director of Institute: H. L. Taylor

Institute Office: Terminal Building, University of Illinois- Willard Airport, Savoy 61874

101. **Private Pilot, I.** Introductory course in partial preparation for FAA Private Pilot certification; includes instruction in aerodynamics, airplane systems, airport and airplane operations, federal regulations, and airplane safety; and includes 27 hours of

flight (21 hours dual, 5 hours solo, and 1 flight exam for qualified individuals), plus 6 hours in a flight simulator. Private Pilot certification requires completion of Aviation 120. 3 hours.

102. **Orientation Refresher.** An intermediate course to provide additional aeronautical proficiency in the primary trainer and serve as an introduction to other types of aircraft; emphasis on airplane utility and safety; eighteen hours of flight, four hours of flight simulator training, and five hours of flight discussion directed to airplane operation. Prerequisite: Credit or concurrent registration in Aviation 101, or consent of director. 0 credit.
105. **Soaring, I.** Basic soaring for those with no previous flight experience; an aviation recreational course covering regulations, navigation, meteorology, aerodynamics, launching, and flight maneuvers required for glider operation; includes approximately twenty dual flights, five solo flights, and eight hours of ground discussion. 1 hour.
115. **Soaring, II.** Intermediate soaring for those with any power flight certificate or previous soaring experience equivalent to Aviation 105; offers additional experience and knowledge preparatory to glider pilot certification; includes approximately ten dual flights, fifteen solo flights, and eight hours of ground discussion. Prerequisite: Aviation 105 or equivalent. 1 hour.
120. **Private Pilot, II.** Second course in preparation for FAA Private Pilot certification; includes instruction in airplane operation, navigation, night flying, and meteorology; and includes 36 hours of flight (19 hours dual, 15 hours solo, and 2 flight exams for qualified individuals), plus 6 hours in a flight simulator. Students successfully completing final examinations will be issued a Private Pilot Certificate. Prerequisite: Aviation 101 or a Private Pilot Certificate; consent of director. 3 hours.
130. **Commercial-Instrument, I.** The first of a series of advanced flight courses in preparation for an FAA Commercial Pilot Certificate; reviews cross-country flight with emphasis on local instrument flying procedures; and includes 40 1/2 hours of lecture-discussion on instrument flying, navigation, advanced maneuvers, and flight physiology, and 32 hours of flight (12 1/2 dual, 16 solo, and 3 1/2 pilot-in-command to include 1 flight exam for qualified individuals), plus 8 hours in a flight simulator. Prerequisite: Aviation 120, consent of director. 3 hours.
140. **Commercial-Instrument, II.** The second of a series of advanced flight courses in preparation for an FAA Commercial Pilot certificate; reviews cross-country flight with emphasis on instrument flying procedures; and includes 40 1/2 hours of lecture-discussion on cross-country procedures, aircraft powerplants and systems, and aircraft maintenance inspections, and 35 hours of flight (12 dual, 18 solo, and 5 pilot-in-command to include 1 flight exam for qualified individuals), plus 8 hours in a flight simulator. Prerequisite: Aviation 130, consent of director. 3 hours.
142. **Powerplant Theory.** Operating principals of a broad range of turbine and reciprocating aircraft powerplants; includes power development and engine efficiency calculations, design and manufacturing techniques, and select engine systems. 4 hours.
143. **Materials and Processes, I.** A study of materials and processes used in the maintenance and repair of aircraft; includes theory and practice in precision measurement, identification and use of hardware, safetying techniques, identification of materials used in aircraft plumbing systems, and nondestructive inspection methods. 3 hours.
144. **Powerplant Theory Laboratory.** An application of the principles of construction, theory of operation, and airworthiness criteria as introduced in Aviation 142; includes maintenance procedures and engine operation for both piston and turbine powerplants. Prerequisite: Credit or concurrent registration in Aviation 142. 2 hours.
145. **Aircraft Electrical Systems.** A study of the physical principles that apply to present-day aerospace vehicles; includes AC and DC electrical theory, power sources, transmission, measurement, solid state devices, integrated circuits, and troubleshooting problems in aircraft electrical circuits. 3 hours.

147. **Introduction to Federal Aviation Regulations.** A study of regulations, directives, and specifications governing the manufacture, operation, and maintenance of aircraft, and the control of air traffic as well as the qualifications and certification of personnel and equipment engaged in aircraft operation and maintenance. 3 hours.
152. **Powerplant Systems, I.** Theory and operating principles of the ignition, starting, and electrical power generating components and systems used with aircraft turbine and reciprocating powerplants. Prerequisite: Aviation 142 and 145. 4 hours.
153. **Aircraft Materials and Processes, II.** A survey of materials used in the manufacture of structural components of aerospace vehicles; emphasis on the sources, manufacturing processes, physical properties, and working characteristics of various ferrous and nonferrous metals. 2 hours.
154. **Powerplant Systems, II.** Theory of operation, design, and maintenance procedures for fixed pitch and controllable propellers; includes a study of propeller governing and control systems for reciprocating and turboprop engines. Prerequisite: Aviation 145. 3 hours.
155. **Aerodynamics and Load Planning.** Calculating wing rib layout, load factors, load planning, weight and balance, powerplant performance, and an introduction to high speed aerodynamics. 3 hours.
156. **Powerplant Systems, III.** An introduction to fuels and fuel systems as related to aircraft turbine and reciprocating powerplants; study of fuel system functions including carburetion, fuel injection, fuel management, and supercharging. Prerequisite: Aviation 142 and 145. 3 hours.
157. **Powerplant Conditioning and Testing.** A study of powerplant malfunction, diagnosis and maintenance procedures, materials, and equipment; includes condition monitoring techniques and some of the economic aspects of powerplant maintenance. Prerequisite: Aviation 152 and 156. 7 hours.
159. **Aircraft Nondestructive Inspection.** A study of specialized inspection techniques, equipment, and procedures used in aircraft maintenance; includes federal aviation regulations, advisory circulars, airworthiness directives, and manufacturers' publications as they apply to powerplants and airframes. Prerequisite: Aviation 142, 143, 144, and 153; and concurrent registration in Aviation 157 or consent of instructor. 3 hours.
163. **Aircraft Materials and Processes, III.** A survey of nonstructural materials used in the construction of aircraft components; the sources, manufacturing processes, physical properties, and working characteristics of synthetics, fabrics, composites, woods, and their associated surface treatments studied in detail. Prerequisite: Credit or concurrent registration in Aviation 143. 3 hours.
164. **Aircraft Systems: Survey of Rotary Wing Technology.** Includes airfoil and drive system inspection, powerplant operation, fire detection, extinguishing systems, hydraulics, pneumatics, flight control, and electrical systems. Prerequisite: Consent of instructor. 3 hours.
165. **Aircraft Fabricating Processes, I.** Procedures and techniques of mechanical, nonfusion attachment; sheet metal forming; and use of adhesives, bonded materials, and plastics in aircraft component fabrication. Laboratory experiences include the use of mechanical fasteners, similar and dissimilar metal assembly, and plastic and bonded structure fabrication. Prerequisite: Aviation 143, 153, and 155. 4 hours.
167. **Aircraft Fabricating Processes, II.** Fusion and adhesion procedures and techniques including gas, AC and DC arc, and inert gas processes. Laboratory experiences include fusion and adhesion processes with representative metals used in the aircraft industry. Prerequisite: Aviation 143 and 153; General Engineering 105. 3 hours.
169. **Aircraft Systems, I.** A study of basic principles and design concepts of the environmental and life-support systems used in modern aircraft; study of representative systems for pressurization, oxygen, heating, cooling, and ice and fire protection with detailed emphasis on individual components and their relationship to the complete system. Prerequisite: Aviation 145. 4 hours.

170. **Aircraft Systems, II.** Electrical distribution circuits and associated lighting, power, communication, navigation, and instrumentation systems common to modern aircraft; emphasis on circuit analysis and performance testing. Prerequisite: Aviation 145, 152, and 155. 5 hours.
172. **Aircraft Systems, III.** Includes hydraulic and pneumatic power systems as utilized in modern aircraft; emphasis on theory of operation, design concepts, component relationships, and malfunction diagnosis. Prerequisite: Aviation 145. 3 hours.
174. **Aircraft Assembly and Inspection.** Aircraft assembly, configuration, and alignment consistent with associated aerodynamics; includes structure and systems inspection, and FAA regulations. Prerequisite: Aviation 163, 165, 167, 169, 170, and 172; or concurrent registration in Aviation 169, 170, or 172, and consent of instructor. 5 hours.
181. **Aircraft Communication Systems.** Comprehensive study of the characteristics and operating principles of modern very-high frequency (VHF) and ultra-high frequency (UHF) airborne communications equipment. Prerequisite: Acceptance in Coordinated Avionics Program; concurrent registration in Aviation 182 and 183. 5 hours.
182. **Aircraft Navigation Systems.** Study of the characteristics and operating principles of airborne navigation equipment; includes VHF omnidirectional range (VOR), instrument landing system (ILS), automatic direction finding (ADF), and area navigation (RNAV). Prerequisite: Acceptance in Coordinated Avionics Program; concurrent registration in Aviation 181 and 183. 5 hours.
183. **Aircraft Pulse Systems.** Operating principles, applications, diagnosis, and maintenance of airborne pulse equipment, including distance-measuring equipment (DME), transponders, and radar. Prerequisite: Acceptance in Coordinated Avionics Program; concurrent registration in Aviation 181 and 182. 5 hours.
185. **Aircraft Flight Control Systems.** Operating principles, diagnosis, and maintenance of flight directors, autopilots, and area navigation (RNAV) airborne computers (analog and digital). Prerequisite: Aviation 181, 182, and 183. 5 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Commercial-Instrument, III.** The third in a series of advanced flight courses in preparation for the FAA Commercial Pilot certificate; IFR/VFR cross-country; includes 40 1/2 hours of lecture-discussion on advanced maneuvers, aerodynamics, and navigation and 31 hours of flight (11 1/2 dual, 15 solo, and 4 1/2 pilot-in-command to include 1 flight exam for qualified individuals), plus 8 hours in a flight simulator. Prerequisite: Aviation 140, consent of director. 5 hours.
210. **Commercial-Instrument, IV.** The fourth and final in a series of advanced flight courses in preparation for the FAA Commercial Pilot certificate with an instrument rating: IFR, VFR cross-country, and VFR commercial maneuvers; includes 40 1/2 hours of lecture-discussion on applied meteorology, aircraft operation, and federal aviation regulations and 31 1/2 hours of flight (13 1/2 dual, 10 solo, and 8 pilot-in-command to include 2 flight exams for qualified individuals), plus 4 hours in a flight simulator. Prerequisite: Aviation 200, consent of director. 5 hours.
220. **Flight Instructor.** Prepares the commercial pilot for an FAA Flight Instructor certificate. Forty-eight classroom hours of ground school instruction on techniques of flight instruction and theory of flight, and a minimum of twenty-three hours of flight training in four-place aircraft, two hours in a flight simulator, three hours practice teaching in a flight simulator, and one hour flight check. Prerequisite: Commercial pilot certificate; instrument rating; junior standing; consent of director. 3 hours.
222. **Instrument Flight Instructor.** Leads to an instrument instructor's rating on the student's flight instructor certificate; five hours of simulator, ten hours of flight and one hour of flight check time. Includes refresher on chart symbol interpretation, federal aviation regulations, communications, instrument construction and operation, and electronic aids to navigation; designed to include obtaining a flight instructor instrument rating. Prerequisite: Commercial pilot certificate; instrument rating; flight instructor certificate; airplane rating; consent of director. 1 hour.

224. **All Attitude Orientation.** Safe handling of an aircraft in all attitudes through various aerobatic maneuvers which include loops, snap rolls, slow rolls, Immelmann, Cuban 8's and similar type maneuvers; thorough check of takeoff and landing procedures. Prerequisite: Aviation 101 and 120 or the private pilot certificate; consent of director. 1 hour.
250. **Practice Teaching, Airplane.** Practice teaching using classroom, audiovisual material, simulator, and airplane; prepares the certified flight instructor to teach in all modes of aviation education. A minimum of 2 hours of classroom lecture, 5 hours of simulator instruction, and 19 hours of airplane instruction is given by the student; an additional 20 hours of classroom lecture clarifies and explains the proper method of successful instruction. Prerequisite: Aviation 220 or flight instructor certificate; junior standing; consent of director. 3 hours.
280. **Special Rating (Multiengine Land).** Prepares the commercial pilot for an FAA multiengine land airplane rating; 16 hours of discussion and 9 hours of flight (7 1/2 dual, 1/2 solo, and 1 flight exam for qualified individuals in a multiengine land airplane). Prerequisite: Commercial Pilot Certificate, consent of director. 1 hour.
284. **Jet Aircraft Systems and Operations, I.** An operator- oriented study of modern jet systems and procedures, including related federal aviation regulations, aerodynamics, weight, and balance; preparation for the airline flight engineer. Prerequisite: Aviation 169, 170, 172, and 210, or equivalent; or consent of instructor. 3 hours.
290. **Advanced Topics in Avionics.** Independent study of advanced topics in the applications of aviation electronics. Prerequisite: Second year standing in aviation or consent of instructor. 1 to 4 hours.
291. **Special Ratings and/or Specialized Flight.** Prepares the commercial pilot for special FAA pilot certificates and/or ratings such as seaplane, airline transport pilot, and helicopter, and specialized flight such as advanced multiengine operation; sixteen hours of preflight (ground school) instruction and variable flight instruction as selected by the student. Options are advanced multiengine, helicopter, and airline transport pilot. Registration is limited to professional students with approval of director through chief flight instructor. Prerequisite: Commercial pilot certificate; consent of director. 1 hour.
294. **Airport Management.** Management problems in planning, design, operation, maintenance, and administration of airports; legislation and federal regulations affecting air commerce and airports; and current problems in certification, security, safety, land acquisition, zoning, and state and federal participation in airport development. Prerequisite: Aviation 101 and Business Administration 210 or 247, or consent of instructor. 3 hours.
355. **Aviation Safety Augmentation.** Fundamental concepts of aviation safety augmentation with emphasis on accident prevention through accident investigation, casualty reduction through crashworthy design, and safety enhancement resulting from litigation; accident investigation techniques and crash survival design factors. Prerequisite: Aviation 101 or consent of instructor. 3 hours, or 1/2 or 1 unit.
397. **Human Factors in Aviation Research.** Research topics dealing with pilot training and aircraft displays, such as pilot selection and performance prediction, adaptive training, use of aircraft simulators, evaluation of momentary and sustained pilot workload, symbolic versus pictorial displays, and computer- generated displays; emphasizes new methods, procedures, and current approaches to behavioral research in aircraft systems. Prerequisite: Psychology 235 and 258, or equivalent. 3 hours, or 1/2 or 1 unit

BANDS

Director: Professor H. Begian

Office: 144 Harding Band Building, 1103 S. Sixth, Champaign

Band courses are open to all students who have been accepted by examination, with assignments being made according to proficiency and instrumentation. Completion of each course involves, in addition to the regular schedule of rehearsals, participation in the public appearances of the bands.

101. **Symphonic Band.** Maintains a complete symphonic band instrumentation for the study and performance of all types of band literature. 1 hour.
102. **Symphonic Band, II.** Maintains a complete symphonic band instrumentation for the study and performance of all types of band literature. 1 hour.
103. **First Concert Band.** Maintains the instrumentation of the standard band and serves as a training organization for the symphonic bands. The literature studied and performed is of the highest calibre and technical difficulty. 1 hour.
104. **Second Concert Band--A.** Enrolls those who do not at first qualify for positions in the other bands until they become eligible for promotion as improvement is shown and as vacancies occur. The band literature studied is of high quality but technically is less difficult than the music for the top three bands. 1 hour.
105. **Second Concert Band--B.** Enrolls those who do not at first qualify for positions in the other bands until they become eligible for promotion as improvement is shown and as vacancies occur. The band literature studied is of high quality but technically is less difficult than the music for the top three bands. 1 hour.
106. **Marching Band.** The Marching Band prepares and performs at least six shows per football season; music used is of the highest available quality. 1 hour.
107. **Basketball Band.** This band is organized to perform for home basketball games. Prerequisite: Band Department audition during early November. 1 hour. Credit is given for spring semester only.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated

BIOCHEMISTRY

Head of Department: Professor L. P. Hager

Department Office: 415 Roger Adams Laboratory, 1209 West California, Urbana

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
292. **Senior Thesis.** Limited in general to seniors in biochemistry and chemistry. Each student who desires to do thesis research must receive written permission from a member of the biochemistry faculty. Accordingly, prospective students are encouraged to contact the biochemistry staff in the semester prior to registration in this course. Students must present a thesis to receive credit in this course. Registration of 10 hours over two semesters is expected. Prerequisite: Biochemistry 350 and 355. 4 to 6 hours.
350. **Introductory Biochemistry.** The chemistry and metabolism of carbohydrates, lipids, proteins, nucleic acids, vitamins, and coenzymes and their relation to the regulation and processes of organisms, cells, and subcellular components. For nonconcentrators in biochemistry. Prerequisite: Chemistry 131 or 136, or equivalent. 3 hours or 3/4 unit. Students may not receive credit for both Biochemistry 350 and the Biochemistry 352-353 sequence.
352. **General Biochemistry.** Principles, chemistry, and methods of analysis of the composition and processes of living systems. Required for biochemistry concentrators. Students should not enroll in Biochemistry 352 without intent to take Biochemistry 353. Prerequisite: Chemistry 110, 122, or 123, and Chemistry 336; or consent of

- instructor. 4 hours or 1 unit. Students may not receive credit for both the Biochemistry 352-353 sequence and Biochemistry 350.
353. **General Biochemistry.** Principles, chemistry, and methods of analysis of the composition and processes of living systems. Required for biochemistry concentrators. Prerequisite: Biochemistry 352 or consent of instructor. 4 hours or 1 unit. Students may not receive credit for both the Biochemistry 352- 353 sequence and Biochemistry 350.
355. **Biochemistry Laboratory.** Introduction to experimentation with biochemical systems, processes, and compounds; identification and quantitative measurement of constituents and transformations in biological systems. Prerequisite: Chemistry 131 or 136, or equivalent; credit or registration in Biochemistry 350, 352, or 353, or equivalent. Quantitative analytical chemistry is recommended. 4 hours or 1 unit.
440. **Research Topics in Biophysical Chemistry.** Same as Biophysics and Chemistry 440. See Chemistry 440.
452. **Experimental Techniques in Biochemistry.** Experiments concerning the detection, isolation, and characterization of macromolecules, including enzymes, antibodies, and nucleic acids; methods of studying the size, shape, and hydrodynamic properties of macromolecules and other compounds. Prerequisite: Biochemistry 355. 1/4 to 1 unit. May be repeated for a maximum of 1 1/2 units credit.
455. **Biochemistry Seminar.** Discussions of current research and literature. Required of all graduate students whose major is biochemistry. Prerequisite: Biochemistry 350 and 355, or equivalent. 1/2 unit.
490. **Special Topics in Biochemistry.** Designed for students majoring or minoring in biochemistry who wish to undertake individual studies of a non-Ph.D. thesis nature under the direction of a faculty member of the department. Prerequisite: Consent of head of department. 1/4 to 4 units (summer session, 1/4 to 2 units).
494. **Chemical Basis of Biological Specificity.** Same as Chemistry 494. Biological formation and interaction of large molecules; analysis of the structural features concerned with functional specificity in heteropolymers, viruses, and subcellular particles; nucleic acids and their role as genetic molecules; proteins in their role as genetic products with highly specific functions; and metabolic interrelations of these molecules. Prerequisite: Chemistry 344 and 346, Biochemistry 352 and 353, or consent of instructor. 1/4 to 3/4 unit. May be repeated for a maximum of 2 units credit.
499. **Thesis Research.** 0 to 4 units

BIOENGINEERING

Chairperson, Executive Committee: F. Dunn

Program Office: 164 Mechanical Engineering Building, 1206 West Green, Urbana

120. **Introduction to Bioengineering.** Readings and discussions on historical development, recent trends, and specific topics such as radiation, modeling, instrumentation, biomaterials, biomechanics, heat and mass transfer, ergonomics, and operations research. 1 hour.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
270. **Individual Study.** Individual projects. Prerequisite: Consent of instructor. 0 to 4 hours.
306. **Mechanical Properties of Biological Materials.** Mechanical properties of biological materials important for bioengineering applications; required term papers and oral reports based on literature survey and/or laboratory projects. Prerequisite: Chemistry 131, Physics 108, or consent of instructor. 3 hours or 3/4 unit.
308. **Implant Materials for Medical Applications.** Review of the biological and engineering aspects of implant materials; characterization of major classes of promising implant materials; and problems of tissue-implant interaction and surgical

problems involved in implant work. Laboratories and independent projects illustrate the use of implant materials. Prerequisite: Chemistry 102; Physics 102 or 108, or consent of instructor. 3 hours or 3/4 unit.

- 314. **Biomedical Instrumentation.** Same as Electrical Engineering 314. See Electrical Engineering 314.
- 315. **Biomedical Instrumentation Laboratory.** Same as Electrical Engineering 315. See Electrical Engineering 315.
- 370. **Special Topics in Bioengineering.** Prerequisite: Consent of instructor. 0 to 4 hours, or 0 to 1 unit. May be repeated.
- 375. **Modeling of Bio-Systems.** Same as Electrical Engineering 375. See Electrical Engineering 375.
- 424. **Ultrasonic Biophysics.** Same as Biophysics 424. See Biophysics 424.
- 498. **Individual Study.** Individual projects. Prerequisite: Consent of instructor. 1/4 to 2 units

BIOLOGY

Director of School of Life Sciences: Professor J. R. Larsen

School Office: 393 Morrill Hall, 505 S. Goodwin, Urbana

- 100. **Biological Sciences.** Introduction to the biological sciences, their aims, content, and methods, with special reference to their application to human life and civilization. Low credit option; no laboratory. 3 hours. Credit is not given for Biology 100 and 101.
- 101. **Biological Sciences.** Introduction to the biological sciences, their aims, content, and methods, with special reference to their application to human life and civilization. High credit option; weekly laboratory. 4 hours. Credit is not given for Biology 100 and 101.
- 102. **Biological Sciences.** Continuation of Biology 100 or 101. Low credit option; lecture and discussion, no laboratory. Prerequisite: Credit in one first-level course in biology. 3 hours.
- 103. **Biological Sciences.** Continuation of Biology 100 or 101. High credit option; lecture, discussion and laboratory. Prerequisite: Credit in one first-level course in biology. 4 hours.
- 104. **Animal Biology.** Classical zoological concepts with emphasis on the diversity and comparative anatomy of animals and the fundamentals of physiology, genetics, evolution, and behavior. Enrollment priority is given to students in curricula which require this course. 4 hours.
- 110. **Principles of Biology, I.** Heredity, evolution, diversity, reproduction, development, structure and function of cells, organisms, and populations. Prerequisite: One year of college chemistry, or concurrent enrollment in Chemistry 102 with laboratory. 5 hours.
- 111. **Principles of Biology, II.** Continuation of Biology 110. Prerequisite: Biology 110. 5 hours.
- 151. **The Cell.** Study of the biology of cells from the molecular to the microscopic level of organization. Students may not receive credit for both Biology 151 and Genetics and Development 213. Prerequisite: Credit or concurrent registration in organic chemistry; consent of honors biology committee. 5 hours.
- 199. **Undergraduate Open Seminar.** 0 to 5 hours. May be repeated.
- 251. **The Organism.** Study of the way different classes of organisms respond to challenges of their environment; emphasis on the general features of organismic behavior. Prerequisite: Biology 151; good standing in the honors biology program; and consent of the honors biology committee. 5 hours.
- 285. **Scientific Writing for Biologists.** Practice in writing about biological subject matter and experience with the retrieval and processing of information in the

biological sciences. Prerequisite: Junior or senior standing in a curriculum related to biological sciences. 3 hours.

303. **Introduction to Neurobiology.** An introduction to the physiology of nerve cells, mechanisms of neural integration, and the organization of sensory and motor systems; also introduces neurochemistry, neuroendocrinology, neural development, neural plasticity, and the physiological basis of behavior. Prerequisite: Biology 111 or 251, or consent of instructor. 3 hours or 3/4 unit.
305. **Fundamentals of Microscopy.** Lectures on applications of transmission and scanning electron microscopy; review of light microscopy, phase contrast, interference, and Nomarski optics. Prerequisite: Physics 102 or equivalent. 3 hours or 3/4 unit.
324. **Chemical Ecology.** The chemical bases of ecological interactions among organisms; topics include the chemical structures and functions of messenger compounds important in inter- and intraspecific interactions among plants, insects, higher animals, fungi, microbes, and their environments. Offered in alternate years. Prerequisite: Courses in organic chemistry and ecology, or consent of instructor. 3 hours or 3/4 unit.
338. **History of Biology.** Same as History 338. See History 338.
339. **Tropical Ecology.** Interactions of climate, soils, plants, and animals (including man) in the tropics; principles of ecology as they are exhibited in a diversity of tropical habitats and as they relate to problems of agricultural and technological development in the tropics. One month of field studies in Latin America during the summer. Prerequisite: Ecology, Ethology, and Evolution 212 or equivalent, and consent of instructor. 8 hours or 2 units.
351. **Population Biology.** Study of problems associated with behavior of plant and animal populations based on genetic, evolutionary, and ecological principles. Prerequisite: Biology 251; statistics; good standing in the honors biology program; consent of Honors Biology Committee. 4 hours or 1 unit.
370. **Mathematical Modeling in Biology.** Introduction to the creation, analysis; and modification of mathematical models in a wide range of life science applications. Prerequisite: Biology 111 and Mathematics 120, or equivalents. 3 hours or 3/4 unit.
371. **Quantitative Biology, I.** Theory and practical application in biology of probability and statistics; lectures and assigned problems. Prerequisite: College algebra; consent of instructor. 4 hours or 1 unit.
372. **Quantitative Biology, II.** Additional statistical topics in biology, including sequential nonrandomness, nonparametric correlation, and binomial sequential sampling; limited enrollment, individual problems, field trips, and lab discussions. Prerequisite: Biology 371 or equivalent introductory statistics course, and consent of instructor. 3 hours or 3/4 unit.
373. **Advanced Biometry.** Bivariate and multivariate statistical treatment of biological experiments and surveys; emphasizes analysis of large, unbalanced data matrices; and follows the general linear model approach. Techniques appropriate to electronic digital computation are considered in detail. Prerequisite: A course in calculus, a course in statistics, and a course or experience in electronic digital computation; or consent of instructor. 5 hours or 1 unit.
380. **Social Issues in Biology.** Ethical and sociopolitical implications of the biological sciences; an issue-oriented lecture-discussion format centering on problems such as bioethics, genetics and development, health care and allocation of scarce resources, death and dying, behavior manipulation, biological experimentation, population control, and environmental ethics. Prerequisite: Upper-division standing and 6 hours of life science. 3 hours or 3/4 unit.
390. **Special Courses.** Experimental and temporary courses. Prerequisite: Consent of instructor. 1 to 5 hours, or 1/4 to 1 unit. May be repeated as topic varies.
430. **Biological Ultrastructure.** Lectures and reports on the fine structure of plant and animal cells and cell products; discussions of possible relationships of ultrastructure to function and of diverse interpretations of chemical-physical information as ultrastructure. Prerequisite: Consent of instructor. 1 unit. Offered in alternate years.

431. **Plant Cell Metabolism.** Same as Agronomy, Forestry, Horticulture, and Plant Pathology 431. One of four courses giving a comprehensive summary of present knowledge in plant physiology; concerns the biochemistry of mature seeds and metabolic processes occurring during seed germination and heterotrophic growth. Meets during the first half of the fall semester. Prerequisite: Botany 330 or equivalent, and an introductory course in biochemistry. 1/2 unit.
432. **Plant Cell Energetics.** Same as Agronomy, Forestry, Horticulture, and Plant Pathology 432. One of four courses giving a comprehensive summary of present knowledge in plant physiology; concerns the energy coupling processes in plant cells (respiration, photosynthesis, photorespiration); and discusses current literature relating to mechanisms of electron transport, phosphorylation, and carbon fixation. Meets during the second half of the fall semester. Prerequisite: Botany 330 or equivalent, and an introductory course in biochemistry. 1/2 unit.
433. **Environmental Regulation of Plant Growth.** Same as Agronomy, Forestry, Horticulture, and Plant Pathology 433. One of four courses giving a comprehensive summary of present knowledge in plant physiology; concerns mechanisms of plant response to the environment, including ion uptake and transport, water relationships, gas exchange, and photosynthesis of whole plants. Meets during the first half of the spring semester. Prerequisite: Botany 330 or equivalent, and an introductory course in biochemistry. 1/2 unit.
434. **Regulation of Plant Development and Reproduction.** Same as Agronomy, Forestry, Horticulture, and Plant Pathology 434. One of four courses giving a comprehensive summary of present knowledge in plant physiology; concerns the hormonal regulation of growth, development, and reproduction and the metabolism of seed and fruit formation. Meets during the second half of the spring semester. Prerequisite: Botany 330 or equivalent, and an introductory course in biochemistry. 1/2 unit.
450. **Scanning Electron Microscopy.** Same as Ceramic Engineering 450. Introduction to theoretical aspects of the scanning electron microscope structure and function, beam-specimen interactions, image characteristics, and qualitative energy-dispersive x-ray microanalysis. Prerequisite: Concurrent registration in Biology 451; a course in modern physics or physical chemistry giving an introduction to wave mechanics; consent of instructor. 1/2 unit.
451. **Scanning Electron Microscopy Laboratory.** Same as Ceramic Engineering 451. Operation of the scanning electron microscope and ancillary equipment; studies of specimen preparation technique development and x-ray microanalysis. Prerequisite: Concurrent registration in Biology 450; consent of instructor. 1/2 unit.
452. **Transmission Electron Microscopy.** Same as Ceramic Engineering 452. Fundamental principles of transmission electron microscopy; topics include instrumentation, electron optics, image formation and interpretation, photographic techniques, and routine specimen preparation. Prerequisite: Concurrent registration in Biology 453 or equivalent; consent of instructor. 1/2 unit.
453. **Transmission Electron Microscopy Laboratory.** Same as Ceramic Engineering 453. Operation, alignment, and performance evaluation of transmission electron microscopy; electron micrography of a variety of specimens, photographic darkroom techniques, and discussion and practice of routine specimen preparation. Prerequisite: Concurrent registration in Biology 452; consent of instructor. 1/2 unit.
454. **Advanced Methods in Electron Microscopy.** Same as Ceramic Engineering 454. Supplementary training in advanced techniques such as electron microprobe analysis, freeze-etch/freeze-fracture techniques, quantitative energy dispersive x-ray analysis, or instruction on specific microscopes. Prerequisite: Biology 450-451 and 452-453; consent of instructor. 1/4 unit. May be repeated.
457. **Ultrastructural Pathology.** Same as Veterinary Pathobiology 457. See Veterinary Pathobiology 457.
490. **Special Topics in Biology.** Individual topics in research and/or reading conducted under the supervision of faculty members in the School of Life Sciences. Designed for students enrolled in the biology program who would like to become more familiar

with specialized fields of study prior to committing themselves to a specific area for their doctorate degree. 1/2 to 2 units.

499. Thesis Research. 0 to 4 units

BIOPHYSICS

(See Physiology and Biophysics)

BOTANY

Head of Department: Professor F. A. Bazzaz

Department Office: 289 Morrill Hall, 505 S. Goodwin, Urbana

- 100. General Botany.** Basic principles of growth and form, physiology, genetics, evolution, and ecology in plant biology. 4 hours. Students may not receive credit for both Botany 100 and 102.
- 102. Plants, Environment, and Man.** Designed primarily to give the nonscience student an introduction to plants, their role in the environment, and their relation to man. Discussions and demonstrations emphasize practical aspects of botany and science as they relate to man. 3 hours. Students may not receive credit for both Botany 100 and 102.
- 220. Evolutionary Survey of the Plant Kingdom.** The morphology and evolution of plants representative of algae, fungi, liverworts, mosses, lower vascular plants, and seed plants. Prerequisite: Botany 100 or 102, or Biology 110 and 111. 3 hours.
- 234. Form and Function in Flowering Plants.** Lecture course on the physiological and morphological attributes that underlie the biosynthesis, growth, and reproduction of flowering plants in relation to the environment. Prerequisite: Botany 100 or 102, or a year of biology; Chemistry 102. 3 hours.
- 260. Introductory Plant Taxonomy.** Classification and identification of flowering plants, with special reference to the local flora and to the needs of high school teachers. Occasional field trips required. Prerequisite: Botany 100, or Biology 100 and 101, or Biology 111. 3 hours.
- 263. Plants and Their Uses by Man.** A consideration of the plants which are useful or harmful to man: their origins and history, botanical relationships, chemical constituents which make them economically important, and their roles in prehistoric and modern cultures and civilizations. Prerequisite: Botany 100, 102, or Biology 110. 3 hours.
- 290. Individual Topics.** For juniors and seniors who wish to study individual problems and topics not assigned in other courses. Prerequisite: Ten hours of advanced work in botany or another biological science; junior or senior standing. 2 to 5 hours. May be repeated for a maximum of 5 hours.
- 292. Senior Thesis.** Independent research for seniors in botany; prerequisite for graduation with distinction in botany and recommended for students intending graduate study. A thesis must be submitted for credit to be received, but graduation with distinction is not an automatic result of enrollment in Botany 292. Will substitute for Botany 290 in fulfilling independent study requirement. Prerequisite: Candidacy for degree with distinction in botany. 2 to 5 hours. May be repeated for a maximum of 10 hours.
- 304. General Plant Morphology.** Lecture and laboratory course dealing with the structure, reproduction, and evolution of representative algae, fungi, bryophytes, pteridophytes, gymnosperms, and angiosperms. Prerequisite: Botany 100, Biology 101, 111, 251, or consent of instructor. 4 hours or 1 unit.

- 320. The Biology of Bryophytes.** Study of mosses, liverworts, and hornworts with emphasis on problems unique to bryophytes and the use of bryophytes as experimental systems for broader botanical problems; topics include the systematics, anatomy, development, physiology, genetics, ecology, and evolution of bryophytes; and lecture, laboratory, and two or three field trips. Offered in alternate years. Prerequisite: One year of botany, or one year of biology plus consent of instructor. 4 hours or 1 unit.
- 325. Paleobotany.** Same as Geology 325. Structure, phylogeny, and geological distribution of representative fossil plants. Two or three field trips. Prerequisite: Botany 100, or Biology 100 and 101; Geology 101 or 107; or consent of instructor. 5 hours or 1 unit.
- 330. Plant Physiology.** General course concerned with plant functions, including water relations, mineral nutrition, metabolism, growth, and reproduction. Prerequisite: Chemistry 131; Botany 100 or Biology 103, 111, or 251. 3 hours or 3/4 unit.
- 332. Photosynthesis.** Same as Biophysics 332. See Biophysics 332.
- 333. Plant Physiology Laboratory.** Same as Agronomy 333 and Horticulture 333. A laboratory course in plant physiology; a supplement to Botany 330 which serves the needs of those interested in acquiring familiarity with techniques of experimental plant physiology. Prerequisite: Credit or concurrent registration in Botany 330 or equivalent. 4 hours or 1 unit.
- 335. Plant Development.** Mechanisms underlying plant development: cytodifferentiation and the cell cycle, regulation of gene expression, induction, determination, morphogenesis, and pattern formation. Prerequisite: Introductory courses in biochemistry, biology, or botany, and calculus. 4 hours or 1 unit.
- 336. Plant Biophysics.** Same as Biophysics 336. Biophysical processes in higher and lower plants; emphasizes cellular and subcellular phenomena underlying structure, function, and energetics. Prerequisite: Biochemistry 350 or equivalent, or consent of instructor. 3 hours or 3/4 unit.
- 341. Field Ecology.** Study of plant communities in various sections of North America during spring vacation. Trips rotate on a three- to five-year basis. Outdoor cooking and camping; transportation in University cars. Prerequisite: One of the following: Botany 260, 366, or 381; consent of instructor. 1 hour or 1/4 unit. May be repeated for a maximum of 3 hours or 3/4 unit.
- 345. Plant Anatomy.** Lecture and laboratory course dealing with the structural characteristics of mature and developing cells, tissues, and organs of vascular plants, with special emphasis on the vegetative parts of seed plants. Prerequisite: One year of botany. 4 hours or 1 unit.
- 350. Phycology.** Introductory lecture and laboratory to the ecology, morphology, physiology, and systematics of the algae. Prerequisite: One year of botany or another biological science, or consent of instructor. 4 hours or 1 unit.
- 351. Viruses.** Same as Microbiology 351. See Microbiology 351.
- 360. Angiosperm Phylogeny and Biogeography.** The phylogeny of the angiosperms and their past and present geographic distribution as reflected in the major floras of the world. Prerequisite: Botany 260 or consent of instructor. 4 hours or 1 unit.
- 363. Plant Products.** Lectures on the natural products of plants, with emphasis on relevant compounds of ecological, pharmacological, toxicological, and economic interest. Prerequisite: Biochemistry 350 or consent of instructor. 3 hours or 3/4 unit.
- 366. Field Botany.** Identification and classification of native and naturalized flowering plants of eastern North America. Prerequisite: Botany 100; consent of instructor. 5 hours or 1 unit. Offered in the summer session only.
- 372. General Mycology.** Structure, classification, and identification of fungi, including those of economic importance. Prerequisite: One year of botany, entomology, microbiology, or biology; consent of instructor. 4 hours or 1 unit.
- 381. Plant Ecology.** Principles of ecology exemplified by vegetation and environments of Illinois. Prerequisite: Botany 260 or equivalent. 5 hours or 1 unit.
- 403. Physiology of Fungi.** Same as Plant Pathology 403. See Plant Pathology 403.

410. **Botany Discussions.** All graduate students in botany, except those with conflicting teaching assignments, are required to register in and attend the general seminar. No credit given except to those students presenting the results of their Ph.D. thesis research. 0 or 1/4 unit.
413. **Discussions in Plant Physiology.** 1/4 unit.
414. **Discussions in Plant Morphology and Taxonomy.** 1/4 unit.
418. **Discussions in Plant Ecology and Plant Geography.** Developments in ecology and plant geography, with emphasis on one special division. Prerequisite: Graduate standing in botany, entomology, geography, or biology. 1/4 unit. May be repeated to a maximum of 1 1/2 units.
419. **Discussions in Photosynthesis and Related Topics.** Prerequisite: Consent of instructor. 0 or 1/4 unit. May be repeated to a maximum of 1 1/2 units.
424. **Enzymes and Metabolic Pathways of Plants.** Same as Agronomy and Horticulture 424. See Agronomy 424.
427. **Discussions in Mycology.** Seminar course designed for discussion of current research in the morphology, taxonomy, and physiology of fungi, especially the nonparasitic forms. Prerequisite: Consent of instructor. 1/4 unit.
435. **Mineral Nutrition of Plants.** Same as Agronomy 435. A study of the essential nutrient elements: accumulation, transport, and roles in plant metabolism. Prerequisite: Botany 330 and Biochemistry 350; or consent of instructor. 3/4 unit.
438. **Bioenergetics of Photosynthesis.** Same as Biophysics 438. See Biophysics 438.
442. **Environmental Plant Physiology.** Same as Agronomy 442. Lecture course dealing with the interaction of plants and environment at the level of the whole organism, extending to the cell and the community; emphasis on heat and mass transfer, plant and soil potentials, and effects of light on growth. Prerequisite: Chemistry 131; general physics; general or plant physiology; consent of instructor. 1 unit.
461. **Angiosperm Systematics.** An integrated approach to the uses of systematic data from genetics and cytogenetics, chemistry, anatomy-morphology, and ecology, and their application to problems in angiosperm classification and phylogeny. Prerequisite: Botany 260 or consent of instructor. 1 unit. Offered in alternate years.
462. **Origin of Variation in Plants.** Same as Agronomy 462. See Agronomy 462.
471. **Advanced Mycology: Special Groups.** The several classes of fungi and their activities are considered in successive semesters. Special groups within these classes may be selected for concentrated study, depending upon the student's interest in mycology. Prerequisite: Botany 372 or consent of instructor. 1/2 unit.
488. **Plant Pigments.** Same as Horticulture 488. See Horticulture 488.
490. **Advanced Studies in Botany.** Not more than 1 unit may be applied toward the Graduate College master's degree requirement of 3 units of course work at the 400 level. Work may be taken in the following areas: (a) anatomy; (b) biochemical cytology; (c) biological rhythms; (d) cytogenetics and speciation; (e) ecology; (f) genetics; (g) morphogenesis and development; (h) morphology; (i) mycology; (j) paleobotany; (k) photosynthesis; (l) phycology; (m) physiology; (n) taxonomy; (o) ultrastructure; and (p) virology. 1/2 to 2 units.
499. **Thesis Research.** Individual work under supervision of members of the staff in their respective fields. 0 to 4 units

BUSINESS

Dean of College: Dean V. K. Zimmerman

College Office: 260 Commerce Building (West), 1206 South Sixth, Champaign

299. **International Business Study in Absentia.** Upon prior written approval of the adviser, the major department, and the College of Commerce and Business Administration office, a student may earn up to 18 credit hours per semester undertaking a study and/or research project in international business away from the

Urbana-Champaign campus. The student's major department verifies the satisfactory progress of the work by means of interim and final written reports, written or oral examinations, or other means established by the department. While absent from the Urbana-Champaign campus, the student must continue to pay all fees required by the University of Illinois to retain continuity of enrollment and to allow the time spent away from this campus to count toward residency. Prerequisite: The student must be a commerce major in good standing who has completed at least 45 semester hours toward a bachelor's degree with at least one semester in residence at the University of Illinois. 0 to 18 hours. This course may be repeated for a maximum of 36 credit hours, all of which must be earned within twelve consecutive months

BUSINESS ADMINISTRATION

Head of Department: Professor Louis R. Pondy

Department Office: 350 Commerce Building (West), 1206 South Sixth, Champaign

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **The Legal Environment of Business.** Examination of the nature of law and the formation and application of legal principles; the role of law in society; the legal environment in which business operates, particularly government taxation; the regulation of commerce, competition, and labor-management relations; and the concept of property: its creation, transfer, and importance to our business society. Prerequisite: Junior standing. 3 hours.
202. **Principles of Marketing.** Emphasizes the concepts of planning, organization, control, and decision making as they are applied in the management of the marketing function. Prerequisite: Economics 172 or equivalent. 3 hours.
203. **Principles of Business Law.** Contracts, the uniform commercial code, creditors' rights, agency and employment, business organizations, and property. Prerequisite: Business Administration 200. 4 hours. Credit is not given for both Business Administration 203 and 261.
206. **Marketing Environment.** Attention is given to the relationship of firm to firm, to government, to labor, and to other organized groups or institutions as they interact with the marketing function of the firm; emphasis on the importance of marketing operations on cultural, political, and social forces, and how these forces affect the alternatives considered and the decision methods used by marketing management. Prerequisite: Business Administration 202. 3 hours.
210. **Management and Organizational Behavior.** A general analysis of management and organizational behavior from a systems point of view, including classical organizational theory and management, organizational behavior, and management science; environmental forces; planning, organizing, and control processes; motivation, incentives, leadership, communication, and interpersonal relations; and discussion of production and decision-making and mathematical models. Prerequisite: Junior standing. Students are encouraged to take Business Administration 202, 210, and Finance 254 concurrently. 3 hours. Credit is not given for both Business Administration 210 and 247.
212. **Principles of Retailing.** Gives a general analysis of the structure of retailing emphasizing the retailing environment and operating efficiencies; includes patronage behavior, merchandise control, pricing, promotion, location, and vendor relations; and gives special attention to emerging trends in retailing. Prerequisite: Business Administration 202. 3 hours.
247. **Introduction to Management.** Summary of management in a modern industrial enterprise; emphasis on motivation, small group behavior, and the problems of designing and operating a formal organization structure. For noncommerce students

- only. Prerequisite: Sophomore standing. 3 hours. Credit is not given for both Business Administration 247 and 210.
261. **Summary of Business Law.** Basic principles of the private law of business including the law of contracts, agency, and business organizations; a brief introduction to the law of sales, commercial paper, security devices, and property. Prerequisite: Junior standing. 3 hours. Credit is not given for both Business Administration 261 and 203.
272. **Industrial Selling.** A survey course in marketing and salesmanship for noncommerce students interested in selling industrial products. 3 hours. Credit is not given for both Business Administration 272 and 202.
294. **Senior Research.** A research and readings course for students majoring in business administration. May be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Cumulative grade-point average of 4.0, honors in the junior year, or consent of instructor; senior standing. 2 to 4 hours.
295. **Senior Research.** A research and readings course for students majoring in business administration. May be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Cumulative grade-point average of 4.0 or honors in the junior year; senior standing. 2 to 4 hours.
300. **Socio-Economic Management as Public Policy.** Same as Accountancy, Political Science, and Social Science 300. See Social Science 300.
314. **Production.** Introduction to production management, consideration of major problems of the production area, and the use of quantitative methods for solving them. Prerequisite: Business Administration 374 or consent of instructor. 3 hours or 1/2 unit.
315. **Management in Manufacturing.** The application of production concepts and quantitative techniques to actual industrial problems; the mathematical structure of the particular production problems; the general structure of the production system and its interaction with marketing and budgeting; and areas including inventory control, production processes, programming, production control, forecasting of production levels, simulation of the production system, and physical planning of industrial plants. Prerequisite: Business Administration 314. 3 hours or 1/2 unit.
320. **Marketing Research.** Study of the collection and analysis of information applied to marketing decision making; utilization of information system concepts in marketing management; and the use of behavioral and statistical research methods in the design and implementation of marketing research projects. Prerequisite: Business Administration 202 and Economics 172. 3 hours or 1/2 unit.
321. **Individual Behavior in Organizations.** Understanding the behavior of employees in work organizations; particular attention to the motivation of individuals to join and perform in organizations and to employee satisfaction with elements of the work environment; and emphasis on various management strategies to modify employee motivation and satisfaction. Prerequisite: Business Administration 210, graduate standing, or consent of instructor. 3 hours or 3/4 unit.
322. **Group Processes in the Organization.** Analyzes several aspects of group techniques within the organization, including norm establishment, communication and comparison processes, collective bargaining, group decision making, problem solving, and coalition formation and conflict. Prerequisite: Business Administration 210 and Psychology 201. 3 hours or 3/4 unit.
323. **Organizational Design and Environment.** Understanding of complex organizations; particular attention to ways of dividing work, achieving coordination, and issues connected with change and adaptation. Prerequisite: Business Administration 210. 3 hours, or 1/2 to 1 unit.
337. **Promotion Management.** Study of the effects of promotion upon sales and society from managerial and behavioral points of view; includes consumer response to advertising, promotional planning and budgeting, advertising and sales research, media selection, legal environment of promotion, and sales force management and

control; and uses case studies and current practices. Prerequisite: Business Administration 202. 3 hours or 1/2 unit.

344. **Consumer Behavior.** Relevance of understanding customer behavior in household and organizational markets for marketing management planning and analysis; provides an overview of explanations of consumption differences anchored in socioeconomic, demographic, cultural, and psychological processes; and surveys the consumer decision-making process and its implications for marketing mix variables. Prerequisite: Business Administration 320. 3 hours or 1/2 unit.
351. **Personnel Administration.** Study of concepts and methods used by the staff personnel unit in building and maintaining an effective work force in an industrial organization; development of ability to design the personnel subsystem within the firm and to deal effectively with problems encountered in such areas as recruitment, selection, training, and wage and salary administration; and considerable emphasis on case analysis, role playing, and research. Prerequisite: Business Administration 323; Economics 173 and 240. 3 hours, or 1/2 to 1 unit. Credit is not given for Business Administration 351 and Psychology 245.
352. **Pricing Policies.** The role of pricing in contemporary marketing and major pricing decisions facing the firm; theoretical, economic, and practical methods and models for setting prices; pricing new products, initiating price changes, and responding to competitive pricing; the relationship of pricing objectives and strategies to the goals of the firm; and sealed bidding for contracts. Prerequisite: Business Administration 202. 3 hours or 1/2 unit.
360. **Marketing Logistics.** The ecology, analysis, and development of integrated distribution systems; the application of quantitative tools, economic analysis, transportation and marketing management in the analysis, and interpretation and design of the physical flow of goods through marketing network alternatives; attention to the theory of market structures, transport networks, location, and cost control; and consideration of site selection, warehousing, inventory management, logistic communications networks, and data control models. Prerequisite: Business Administration 202. 3 hours or 1/2 unit.
370. **International Marketing.** Examines social, political, cultural, and economic environmental differences among countries in terms of their impact on the strategy of extension versus adjustment of marketing practice by multinational corporations; examines each marketing function in detail with respect to the specific areas the international marketer must examine. A special section concentrates on international market research. Prerequisite: Business Administration 344 or consent of instructor. 3 hours or 1/2 unit.
373. **Business Information Systems.** Fundamentals of business data processing; consideration of the use of modern electronic computers in the areas of accountancy, economics, management, marketing, and general business. The facilities of the Digital Computer Laboratory are utilized. Prerequisite: Accountancy 266. 3 hours, or 1/2 or 1 unit.
374. **Operations Research.** Introduction to methods of operations research from an executive or managerial viewpoint, emphasizing formulation of business problems in quantitative terms; industrial applications of linear programming, dynamic programming, game theory, probability theory, queueing theory, and inventory theory. Prerequisite: Business Administration 210 and Economics 173, or consent of instructor. 3 hours, or 1/2 to 1 unit.
380. **Management Science in Marketing.** Develops fundamentals to build and implement models; uses management science in analyzing and solving marketing problems; reviews and evaluates existing management science models; and focuses on analytical and quantitative tools. Prerequisite: Business Administration 202 and 374. 3 hours or 1/2 unit.
389. **Business Policy.** Analysis of policy formulation and implementation from a company-wide standpoint; emphasis on integration of knowledge and approaches across functional areas; both endogenous and exogenous factors which affect company policies; and the role of the firm in society. Prerequisite: Business

- Administration 321 or 344; Business Administration 374; senior standing. 3 hours or 1/2 unit.
391. **Introduction to Management Information Systems.** Same as Accountancy 391. See Accountancy 391.
392. **Information Organization for Management Information Systems.** Same as Accountancy 392. Data collection, classification, verification, and transmission; file organization, including sequential and random processing techniques, record locating, overflow procedures, and file security; analysis of alternative methods of data organization; commercial file management systems; design of data processing systems; and instruction in COBOL and use of case studies. Prerequisite: Accountancy 391 or consent of instructor. 3 hours, or 1/2 to 1 unit.
393. **Management Information System Development.** Same as Accountancy 393. Essential steps in developing a management information system, including preliminary planning, design, feasibility analysis, implementation schedule, and postimplementation review of the system; includes a semester-long project which familiarizes students with methodology and techniques. Prerequisite: Accountancy 391 or Business Administration 392, or consent of instructor. 3 hours, or 1/2 to 1 unit.
394. **Management Information and Control Systems.** Same as Accountancy 394. See Accountancy 394.
400. **Managerial Economics.** Introduction to decision making for the private or public enterprise; principles of economic maximization under uncertainty; and marketing, financial, and production strategies in a dynamic multiperiod context. 1 unit. Graduate credit is not given for both Business Administration 400 and Economics 300 or 400.
401. **The Economic Environment.** Analysis of the functioning of the economy from an aggregative point of view; role of government policy in affecting the economic environment. 1 unit. Graduate credit is not given for Business Administration 401 and Economics 301 or 401.
408. **Foundations of Behavioral Science for Administration.** Develops and integrates fundamental behavioral concepts and theory having administrative applications; initially focuses on the individual decision maker and ultimately includes interpersonal, organizational, and social structures and influences; and develops strategies and methods of research on behavioral applications in business. 1 unit.
409. **Organizational Behavior.** Same as Labor and Industrial Relations 409. Examination and analysis of the organization as a social system and the impact of its various components on work attitudes and behavior; topics include the development of organizational structures, organizational effectiveness, decision making and policy formulation, leadership, and change. Prerequisite: Business Administration 408. 1 unit.
410. **Organizational Sciences, I.** Same as Political Science 460, Psychology 453, and Sociology 456. Introduction to the principal theories and important empirical research in various disciplines that study organizations; in addition to examination of the subject matter content of various disciplines, students critically examine the capacities and limitations of the various fields to make contributions to the study of organizations. Prerequisite: Enrollment as a major in organizational sciences in a cooperating program or consent of instructor. 1 unit.
411. **Problems of Personnel Management.** Same as Labor and Industrial Relations 448. Examination of the organization and administration of the personnel function in management; the relations of personnel administration to operating departments and the scope of business and industrial personnel services; analytical appraisal of policies and practices in selected areas of personnel administration, such as selection and training, carried out through case studies and direct industrial contracts; and specific consideration given to problems up to and including placing the person on a job. Prerequisite: Consent of instructor. 1 unit.
412. **Organization and Its Environment.** Analysis of business organizations adapting to shifts in internal and external elements; major emphasis on (1) the business firm as a

- part of a complex socioeconomic system; (2) the effects of government, labor unions, and political, religious, and business organizations on the executive's decision problems; (3) environmental factors conducive to organizational change; and (4) organizational growth. Prerequisite: Business Administration 409. 1 unit.
- 413. Behavioral and Organizational Decision Making.** Examination of the major types of organization theory; use of organization theory to guide research and to make business decisions; and examination of major research methods used to study business organizations. Prerequisite: Business Administration 412. 1 unit.
- 415. Foundations of Consumer Behavior.** Study of basic factors influencing consumer behavior; attention to psychological, sociological, and economic variables, including motivation, learning, attitude, personality, small groups, social class, demographic factors, and culture, in order to analyze their effects on purchasing behavior. 1 unit.
- 416. Theories of Consumer Behavior.** Methodological approach to theory-building efforts in consumer behavior; examines psychological constructs commonly utilized by theory builders, including motivation, learning, perception, information processing, attitude structures, and brand loyalty, by analyzing the research in various areas of psychology, social psychology, and experimental psychology and their applications to consumer behavior. Prerequisite: Business Administration 415 or Advertising 484. 1 unit.
- 417. Marketing in Public Service Organizations.** Introductory analysis of the marketing problems of public service organizations, including those in the arts, health care, politics, social welfare, and public services; similarities with and differences from marketing in the business sector; problems of goal setting, strategic planning, and coordination for public service marketing programs; techniques for research and evaluation; and projects in program design, pricing, and promotion in public service markets. Prerequisite: Graduate standing and Business Administration 420, or consent of instructor. 1 unit.
- 420. Marketing.** An introductory analysis of the marketing system, its operations, and the mechanisms for coordinating these operations; study of relationships of the firm to other firms and other institutions in the marketing system; analysis of the effects of such relationships on the nature of decision problems of the individual business; and discussion of the firm's problems in developing an integrated marketing program, and the specific problem areas of price, channel, location, sales, and market development. 1 unit.
- 421. Marketing Strategy: Theoretical Foundations.** A formal analysis of strategy drawing on concepts from the theory of games, decision theory, value theory, and information theory; topics cover elements of game models, classes of decision problems, games against nature, modern utility theory, information theory, group decision making, statistical decision theory, and linear and nonlinear optimization. 1 unit.
- 422. Marketing Strategy: Decision Models.** The role of models in the design, implementation, and adjustment of seller strategy; application of simulation, programming, and other methods to the specification and solution of product, price, promotion, and other marketing problems; and topics including the nature of models and model building, forecasting models, optimization models, and other decision models. Prerequisite: Business Administration 421. 1 unit.
- 424. Market Segmentation.** Consideration of unique subsets of a group of potential customers and industrial buyers that may differ in accessibility of behavior from the aggregate market; an historical perspective of market segmentation, alternative bases of segmentation, the role and methods of market segmentation research, and the application of segmentation to marketing decision making. Prerequisite: Business Administration 420 or consent of instructor. 1 unit.
- 425. Product Management.** The decisions on the firm's total market offer, including such topics as use of market analysis in making decisions on assortment, product development, pricing, packaging, branding, and sales forecasting; coordination of these decisions and actions with market communications, physical movement, production, finance, and the overall goals and policies of the firm; and emphasis on

the use of analytic and research methods in making assortment and product decisions. Prerequisite: Business Administration 420 and 472, or consent of instructor. 1 unit.

- 426. Marketing Theory and Systems.** A detailed study of macro- and micro-marketing systems and the various approaches to marketing theory; attention given to general systems theory, the nature of marketing systems, system adaptation to the environment, concepts of theory, and major approaches to macro- and micro-theory in marketing. 1 unit.
- 430. Research Methods in Business Administration.** Theory and practice of research methodology for the study of administrative, industrial, and consumer behavior and organizations; alternative methods of data collection and their strengths and weaknesses; observational, questionnaire, field, and laboratory experimentation and statistical analysis of pregathered time-series and cross-sectional data; and examples of good and bad research in business disciplines. A completed individual research project of potentially publishable nature is formally presented in class. Prerequisite: Basic inferential statistics course; credit or concurrent registration in Business Administration 408. 1 unit.
- 431. Survey Methods in Marketing Research.** Same as Sociology 474. Analysis of survey methods in marketing with emphasis on sample design, data collection, and data processing; an advanced course in the methods required to design, implement, and evaluate a research project. Prerequisite: Economics 171 or equivalent. 1 unit.
- 432. Applied Multivariate Analysis in Business.** Doctoral-level seminar emphasizing applications of multivariate methods to business problems; includes multiple regression, multiple discriminant analysis, AID and MCA, multivariate analysis of variance, canonical correlation analysis, factor and cluster analysis, multidimensional scaling, and recent developments; each technique is described in terms of its mathematical formulation, optimization rule, and underlying sampling theory. Prerequisite: Psychology 494 or equivalent, or consent of instructor. 1 unit.
- 433. Experimental Design.** Training in the design, execution, and interpretation of field and laboratory experimental research; emphasis on the evaluation of alternative designs, execution of problems, and interpretation of data; and a review of illustrative research studies made, an actual study designed, and data collected and interpreted. Prerequisite: Business Administration 472 or consent of instructor. 1 unit.
- 435. The Sampling of Human Populations and Social Organizations.** Same as Sociology 485 and Psychology 485. Procedures for selecting samples from and estimating population parameters for human populations and social organizations; types of sample designs treated include simple random samples, stratified, and cluster samples together with random number and systematic selection techniques; and emphasis given to the study of various kinds of advanced sample designs for both area and institutional settings together with the problems involved in the application of analytical statistics to complicated sampling procedures. Each student is required to participate in a field project which involves the actual selection of a cluster sample from the local area. Prerequisite: Sociology 387 or consent of instructor. 1 unit.
- 442. Social Performance of Business and Government.** The position of the business enterprise as an institution in American society; the role of the businessman in that society. Prerequisite: Completion of the first year of the M.B.A. program or equivalent. 1 unit.
- 443. Legal Aspects of Management Decisions.** The legal environment in which business decisions are made, including the legal system and the role of courts, government taxation and regulation of business, administrative law, antitrust law, labor law, and trends in the law affecting business policy. 1 unit.
- 444. Policy and Planning.** Policy construction and planning of policy implementation at the executive level; case studies of company-wide situations from the management point of view; and integration and application of material from previous courses. Credit is not given for both Business Administration 444 and
- 389. Prerequisite: Business Administration 408, 420, 451, and 467, or equivalent. 1 unit.**

- 451. Financial Management.** An introduction to financial decision making in the firm; development of a decision-making framework for determining the most efficient allocation of resources within the firm; and emphasis placed on the analysis of capital investment projects, long-term sources of funds, and short-term financing problems. 1 unit.
- 452. Long-Term Financial Decision Making.** Same as Finance 452. See Finance 452.
- 453. Working Capital Management.** Same as Finance 453. See Finance 453.
- 455. Risk Management and Control.** Same as Finance 470. See Finance 470.
- 456. Investment.** Same as Finance 456. See Finance 456.
- 457. Security Analysis.** Same as Finance 457. See Finance 457.
- 458. Portfolio Management.** Same as Finance 458. See Finance 458.
- 460. Managerial Accounting and Control.** Analysis of managerial controls, the information needed for their operation, and the manner in which accounting provides that information; emphasis on accounting as a tool of management; and problems and cases stressing the type of figure information relevant to managerial decisions and the methods of using such data. 1 unit.
- 467. Production Management.** An introductory course in decision-making problems in production; includes the theoretical foundations for production management as well as the applications of decision-making techniques to production problems in the firm; and considers production processes, plant layout, maintenance, scheduling, quality control, and production control in particular. 1 unit.
- 468. Production Planning and Control.** In-depth treatment of decision-making topics in production at the factory manager level and above; topics include the development of generalized decision rules and systems analysis in production; and particular emphasis on the design of production control, quality control, and inventory control systems, and how each of these systems is integrated into the firm as a whole. Prerequisite: First year of the M.B.A. program. 1 unit.
- 469. Quantitative Techniques in Production.** An advanced course in the application of quantitative techniques to decision-making problems dealing with production in the firm; topics include structural estimation of production systems, application of operations research techniques to production problems, and computer simulation of decision systems. Prerequisite: Business Administration 468 or equivalent. 1 unit.
- 470. Mathematical Analysis for Management Decisions.** An elementary course in calculus with applications to business and economics; topics include differentiations, integration, Lagrange multipliers, multivariate functions, and matrices. 1 unit.
- 472. Modern and Classical Statistics for Management Decisions.** The application of classical and modern statistics for business decision making. The level of the course assumes some prior knowledge of basic statistics as well as facility with elementary calculus. Prerequisite: Business Administration 470. 1 unit.
- 473. The Quantitative Analysis of Decisions.** Introduction to operations research techniques; topics include the construction and solution of linear models under certainty, and the construction of probabilistic models, specifically queueing theory, Markov chains, and sequential decisions. Prerequisite: Business Administration 470. 1 unit.
- 474. Applications of Operations Research Techniques.** The application of the operations research techniques developed in Business Administration 473 to practical business problems. Most of the semester is devoted to a series of field research studies. A review of previous work in the field is made prior to the field studies, and the role of the computer in solving operations research problems and its application to the field research is also a major consideration. Prerequisite: Business Administration 473. 1 unit.
- 475. Systems Modeling and Simulation.** Same as Computer Science 445. Theory and techniques of simulation and gaming; simulation languages such as GPSS, DYNAMO, and SIMSCRIPT. Applications: investigation, control, and design of various systems (inventory, production scheduling, computer, marketing, and others). Prerequisite: Computer Science 105 or Mathematics 363 or Business Administration 374, or equivalent, or consent of instructor. 1 unit.

- 476. Business Forecasting and Econometrics.** Introduction to maximum likelihood estimating techniques; topics including the use and limitations of least squares, two-stage least squares, limited-information and full-information estimates; and consideration of problems with observational errors, multicollinearity, and autocorrelation in time-series and cross-section structural estimation. A major portion of the course is devoted to the application of the econometric techniques in business forecasting and analysis. Prerequisite: Business Administration 472. 1 unit.
- 477. Economics of Decision Making.** The operational analysis of the problems of individual decisions under uncertainty that arise in the practice of management. Prerequisite: Business Administration 472. 1 unit.
- 478. Stochastic Models in Management Science.** Application of Markov processes to describe, analyze, and design systems of interest in management science, including queues, inventory, production, brand loyalty, stock market, and other applications. Prerequisite: Mathematics 361 or 363, or equivalent. 1 unit.
- 479. Mathematical Programming for Management Science.** Mathematical programming models (linear, integer, quadratic, nonlinear, dynamic, and combinatorial) used to describe, analyze, and design systems such as production, transportation, scheduling, and planning. Prerequisite: Mathematics 315 or equivalent. 1 unit.
- 482. International Business Operations, I.** An integration of economics and the functional areas of business focused on the problems of managing international business operations; study of economic, legal, functional, and administrative problems through cases and literature emphasizing financial and marketing problems. Students select one area from the following for special study and reporting: Europe, Latin America, Africa, Middle and Near East, or South Asia and Far East. Prerequisite: Completion of first year of the M.B.A. program. 1 unit.
- 483. International Business Operations, II.** Continuation of Business Administration 482. Prerequisite: Business Administration 482. 1 unit.
- 490. Seminar in Business Administration.** Special topics in the general area of business. Topics are selected by the instructor at the beginning of each semester. 0 to 1 unit.
- 491. Seminar in Special Topics.** Lectures in topics of current interest not covered by regular course offerings. Subjects are announced in the Timetable. Prerequisite: Consent of instructor or head of department. 1/4 to 1 unit.
- 493. Research in Special Fields.** 1/4 to 2 units.
- 494. Independent Study and Research.** Directed reading and research. 1/2 or 1 unit.
- 499. Dissertation Research.** Required of all students writing doctoral dissertations in business administration; guidance in writing theses and seminar discussions of interim progress reports. 0 to 4 units

BUSINESS AND TECHNICAL WRITING

(See English)

CATALAN

(See Spanish, Italian, and Portuguese)

CERAMIC ENGINEERING

Head of Department: Professor C. G. Bergeron

Department Office: 204 Ceramics Building, 105 South Goodwin, Urbana

- 190. Topics in Ceramic Engineering.** A course for freshmen providing an opportunity to become acquainted with ceramic engineering, and to participate in an engineering course in the freshman year. Discussions and demonstrations on ceramic materials, processes, and properties. Ceramic articles, glasses, ceramic magnets, and coatings are made in laboratory demonstrations. Environmental concerns of the ceramic industries, as well as the economic structure of the industries, are discussed. 1 hour.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Ceramic Crystal Chemistry.** Crystal structure and crystal chemistry of ceramic materials, including the structure of silicates; geometrical crystallography and discussions of crystal character and crystal growth of ceramic materials. 3 hours.
- 202. Ceramic Materials and Processes.** Characterization of ceramic raw materials and their preparation, fabrication, and processing. Prerequisite: Sophomore standing. 3 hours.
- 205. Phase Equilibria in Ceramic Systems.** The concepts, interpretations, and utilization of phase equilibrium diagrams in multicomponent ceramic systems at high temperatures; methods of determining equilibrium relationships; and interpretation of binary, ternary, and quaternary systems emphasizing quantitative calculations, metastability, and the origin of microstructure. Lecture and discussion. Prerequisite: Concurrent registration in Ceramic Engineering 245 or consent of instructor. 3 hours. Students may not receive credit for both Metallurgical Engineering 312 and Ceramic Engineering 205.
- 208. Thermal Processing.** The application of the principles involved in drying and high-temperature operations utilized in processing ceramic materials. Prerequisite: Junior standing in ceramic engineering. 3 hours.
- 216. Rate Processes in Ceramic Engineering.** Reaction kinetics of ceramic processes; high-temperature phase transformations, sintering and grain growth, nucleation and crystal growth from melts; and mechanisms of material transport in solid and liquid systems. Prerequisite: Ceramic Engineering 245; junior standing in ceramic engineering. 3 hours.
- 221. Pyrometry.** Principles and methods used in high-temperature measurement and introduction to process temperature control. Prerequisite: Junior standing in engineering or equivalent. 2 hours.
- 245. Physical Chemistry for Engineers.** Same as Chemistry 245. Primarily for ceramists, metallurgists, and other engineering students; not offered to chemistry or chemical engineering majors. Provides the elements of chemical thermodynamics and chemical kinetics, and provides an introduction to the statistical concepts of entropy. Prerequisite: Chemistry 102; Physics 107 or 108; Mathematics 240 or 241, or equivalent. 3 hours.
- 271. Design of High-Temperature Systems.** Design for dryers, kilns, and furnaces for ceramic facilities. Prerequisite: Ceramic Engineering 208; Theoretical and Applied Mechanics 221. 3 hours.
- 297. Senior Seminar.** Lectures and discussions dealing with professional practice, job selection, employment practice, continuing education, professional growth, and economics of the ceramic industries. Prerequisite: Senior standing in ceramic engineering. 1 hour.
- 298. Special Problems.** Special topics in ceramic engineering. Written permission from the instructor with whom the student is to work must be presented to the student's adviser at the time of registration. Prerequisite: Senior standing. 1 to 2 hours. May be repeated to a maximum of 2 hours.
- 299. Senior Thesis.** Research in ceramics and ceramic engineering. Written permission from the instructor with whom the student is to work must be presented to the student's adviser at the time of registration. To receive credit, a thesis must be

- presented. Prerequisite: Senior standing; grade-point average of 4.0 or better. 1 to 5 hours. May be repeated for a maximum credit of 5 hours and a minimum credit of 3 hours.
307. **Thermal and Mechanical Properties of Ceramics.** Interprets the thermal and mechanical behavior of crystalline and amorphous ceramics in terms of atomistic concepts of materials; examines influences of microstructure, composition, temperature, pressure, time and other controllable parameters. Prerequisite: Ceramic Engineering 216 and Theoretical and Applied Mechanics 221. 3 hours or 3/4 unit.
309. **Ceramic Processing.** Examines principles and details of ceramic processing operations; case histories and unit operations for a wide variety of ceramic products; and interrelationships that exist between materials, composition, fabrication, properties, and characterization. Prerequisite: Junior standing in engineering or physical sciences. 3 hours or 3/4 unit.
310. **Refractory Technology.** Engineering properties and thermochemistry of polycrystalline materials for use at elevated temperatures including processing of raw materials and the manufacture, heat treatment, quality control, and specification of refractory products; particular emphasis on oxides, silicates, carbides, borides, cermets, and refractory metals with a correlation of the properties of those materials to certain design criteria. Includes laboratory if taken for 1 unit of graduate credit. Prerequisite: Senior standing in engineering. 3 hours, or 3/4 or 1 unit.
311. **Ceramic X-Ray Analysis.** X-ray diffraction for phase identification, for the determination of crystalline lattice parameters, and for the determination of the thermal expansion of crystalline solids; analytical methods of indexing powder diffraction patterns; the determination of precise lattice parameters by means of computer programming and high-temperature x-ray techniques. Prerequisite: Computer Science 101 and senior standing in engineering, chemistry, or geology, or consent of instructor. 3 hours or 3/4 unit.
312. **Ceramic Coatings.** Examines principles and technology of a wide range of ceramic coatings; emphasizes chemistry and physics that underlie coating properties, and application processes; and studies types of coatings treated including porcelain enamels, glazes, melt-sprayed coatings, vapor deposited coatings, electrolytically deposited coatings, weld-rod coatings, and sputtered coatings. Prerequisite: Ceramic Engineering 245; or Metallurgical Engineering 314 and 370; or consent of instructor. 3 hours or 3/4 unit.
314. **Chemistry and Technology of Glass.** Glass structure and constitution and their relationship to chemical, physical, and electrical properties; melting, forming, and annealing operations; preparation of glasses and measurement of important glass properties; lectures and laboratory. Prerequisite: Junior standing in engineering, chemistry, physics, or geology. 3 hours or 3/4 unit.
331. **Ceramic Microscopy.** Study of the optical activity in isotropic and anisotropic media with particular emphasis on the materials and products of ceramics; the application of these principles and related topics of optical microscopy to the study of the morphology, aggregation, size, and microstructure of the products of high-temperature thermochemical reactions and equilibria. Includes studies in thermal microscopy if taken for 1 unit of graduate credit. Prerequisite: Ceramic Engineering 205 or consent of instructor. 3 hours, or 3/4 or 1 unit.
340. **Electrical Ceramics.** Presentation of the subject of dielectric crystals and their electrical properties; discussion and correlation of ferroelectric and piezoelectric properties of several crystal classes; coverage in detail of the perovskite class of ferroelectric compounds; and discussion of spinel, garnet, and hexagonal type ferrimagnetic crystals and their properties. Prerequisite: Ceramic Engineering 309 or consent of instructor. 3 hours or 3/4 unit.
388. **Nuclear Ceramics.** Same as Nuclear Engineering 388. Study of the characterization, behavior, and utilization of ceramic materials for the radiation environment of modern nuclear reactor devices with particular emphasis on the power reactor; discussion of material functions in radiation environment, the ceramic nuclear fuel cycle, radiation damage in nonfissile ceramics, and nuclear carbon,

- graphite, and nonfuel ceramic isotope utilization. Prerequisite: Chemistry 245 or Physics 383, or consent of instructor. 3 hours or 1 unit.
398. **Special Topics.** Studies advanced topics related to ceramic engineering. Prerequisite: Junior standing or consent of instructor. 1 to 4 hours, or 1/4 to 1 unit.
401. **Ceramic Chemistry.** Silica, silicates, fusions, and phase relations. Prerequisite: Courses in chemistry and physics. 1 unit.
405. **Glass Technology.** Following a brief review of unit processes and operations in glass manufacture, the course treats selected major topics relating to the glass preparation process and the chemical, mechanical, optical, and electrical properties of glass from a dominantly theoretical and research point of view. Prerequisite: Ceramic Engineering 314 or equivalent, or consent of instructor. 3/4 or 1 unit. Extra contact hours will be arranged for students electing the course for 1 unit.
410. **Dielectric Properties of Ceramic Materials.** Review of fundamental properties of vector fields; consideration of the reaction of insulating solids to external electric fields in terms of dielectric theory; the properties of ceramic dielectrics including treatment of ferroelectrics in terms of present theory; and correlation of the piezoelectric properties of ferroelectric crystals and ceramics with the crystal structure, microstructure, and the ferroelectric properties. Prerequisite: Mathematics 345 and 343, or consent of instructor. 3/4 or 1 unit. Extra contact hours will be arranged for students electing the course for 1 unit.
412. **Structural Physical Ceramics.** Structural chemistry and crystallization behavior of ceramic systems at elevated temperatures; nucleation, and crystal growth; mineral synthesis; and high-temperature reaction kinetics including phase transformations and diffusion. 3/4 or 1 unit. Extra contact hours will be arranged for students electing the course for 1 unit.
414. **Physical Chemistry of Clays and Soils.** Same as Soils 414 and Mining Engineering 414. See Soils 414.
418. **Physics of Strong Solids.** Characterization and interpretation of physical properties of single-phase and composite materials of high strength; covalently bonded semiconductors; transition-metal carbides; borides and nitrides; graphite; glass; fibers; and precipitation-hardened metals. Prerequisite: Any one of the following: Ceramic Engineering 307 or 421, Metallurgical Engineering 384, Chemistry 342 or Physics 490, or consent of instructor. 1 unit.
421. **Refractory Materials Engineering.** Interpretation of the behavior of materials for utilization in an environment where high-temperature structural stability and control of thermal energy transport are the prime considerations; emphasis on design and material selection criteria based on thermal energy control, mechanical stress response, and structural integrity at elevated temperature. Prerequisite: Ceramic Engineering 310 or consent of instructor. 1 unit.
450. **Scanning Electron Microscopy.** Same as Biology 450. See Biology 450.
451. **Scanning Electron Microscopy Laboratory.** Same as Biology 451. See Biology 451.
452. **Transmission Electron Microscopy.** Same as Biology 452. See Biology 452.
453. **Transmission Electron Microscopy Laboratory.** Same as Biology 453. See Biology 453.
454. **Advanced Methods in Electron Microscopy.** Same as Biology 454. See Biology 454.
461. **Mineralogy of Clays.** Same as Geology 461. See Geology 461.
462. **Mineralogy of Clays.** Same as Geology 462. See Geology 462.
495. **Materials and Special Problems.** Conference and laboratory. Prerequisite: Graduate standing in ceramic engineering. 0 to 2 units.
497. **Research Seminars.** Discussion and lectures on current research topics. 0 or 1/4 unit. May be repeated each semester.
498. **Seminar in Ceramics.** Lectures on current ceramic research and development; presentations by visiting lecturers as well as graduate students and staff in the department. Registration required of all graduate students in ceramic engineering.

Graduate students nearing completion of their theses are required to make a seminar presentation. Prerequisite: Graduate standing in ceramic engineering. 0 credit.

499. **Thesis Research.** Research in any of the branches of ceramics. Prerequisite: Graduate standing in ceramic engineering; Ceramic Engineering 311. 0 to 4 units

CHEMICAL ENGINEERING

Head of Department: Professor C. A. Eckert

Department Office: 114 Roger Adams Laboratory, 1209 West California, Urbana

161. **The Chemical Engineering Profession.** Lectures and problems on the history and scope of chemical engineering endeavors; decisions and criteria for process development and plant design. Prerequisite: Chemistry 101 or 107. 1 hour.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Cooperative Education: Planning.** Same as Chemistry 201. See Chemistry 201.
202. **Cooperative Education: Industrial Practice.** Same as Chemistry 202. See Chemistry 202.
261. **Introduction to Chemical Engineering.** Lectures and problems on material and energy balances. Prerequisite: Chemistry 102 or 108. 3 hours.
292. **Senior Thesis.** Limited in general to seniors in the curriculum in chemical engineering. Any others must have the consent of the head of the department. Each student taking the course must register in a minimum of 5 hours either in one semester or divided over two semesters. A maximum registration of 10 hours in two semesters is permitted. However, Chemical Engineering 390 (2 hours) may be substituted for 2 of the 5 hours required in Chemical Engineering 292. In order to receive credit, a thesis must be presented by each student registered in Chemical Engineering 292. 2 to 6 hours.
370. **Chemical Engineering Thermodynamics.** Fundamental concepts and laws of thermodynamics with emphasis on application to chemical engineering problems; introduction to phase equilibria. Prerequisite: Chemical Engineering 261. 3 hours or 1/2 unit.
371. **Fluid Mechanics and Heat Transfer.** Introduction to fluid statics and dynamics; dimensional analysis; design of flow systems; and introduction to heat transfer conduction, convection, and radiation. Prerequisite: Chemical Engineering 261 or consent of instructor. 4 hours or 1 unit.
373. **Mass Transfer Operations.** Introduction to mass transfer processes and design methods for separation equipment. Prerequisite: Chemical Engineering 371 or consent of instructor. 4 hours or 1 unit.
374. **Chemical Engineering Laboratory.** Experiments and computation in fluid mechanics, heat transfer, reaction kinetics, and separation processes. Prerequisite: Credit or concurrent registration in Chemical Engineering 373, and junior or senior standing in chemical engineering. 3 hours or 1/2 unit.
377. **Synthesis and Design of Chemical Systems.** Techniques used in the synthesis and analysis of designs for chemical processing systems; emphasizes the strategy of process engineering, including economic analysis, process simulation, and optimization. This is a capstone course designed to bring together principles from previous courses for the design of complete processes. Prerequisite: Credit or registration in Chemical Engineering 381; Mathematics 345; Computer Science 101. 3 hours or 3/4 unit.
380. **Heat, Mass, and Momentum Transport.** A unifying treatment of physical rate processes with particular emphasis on the formulation and solution of typical boundary value problems associated with heat, mass, and momentum transport. Prerequisite: Chemical Engineering 371 or consent of instructor; Mathematics 343 or 345. 3 hours or 3/4 unit.

381. **Chemical Rate Processes and Reactor Design.** Chemical kinetics, chemical reactor design, and the interrelationship of transport and chemical reaction in open and closed systems. Prerequisite: Credit or registration in Chemical Engineering 373. 2 hours or 1/2 unit.
382. **The Prediction of Physical Properties.** Prediction of equilibrium and transport properties in gases, liquids, and solids. Prerequisite: One year of physical chemistry. 2 hours or 1/2 unit.
384. **Process Design Project.** A comprehensive design project; complements material covered in Chemical Engineering 377. Prerequisite: Credit or registration in Chemical Engineering 377. 1 to 3 hours, or 1/4 to 3/4 unit.
387. **Applied Chemical Kinetics and Catalysis.** Problems in chemical kinetics; techniques for the prediction and measurement of rates of reactions; and homogeneous and heterogeneous catalysis chain reactions. Prerequisite: Chemistry 342 or Chemical Engineering 370. 2 or 3 hours, or 1/2 or 3/4 unit.
388. **Electrochemical Engineering.** Fundamentals of analysis, design, and optimization of electrochemical systems. Prerequisite: Senior standing in physical science or engineering. 2 or 3 hours, or 1/2 or 3/4 unit.
389. **Chemical Process Control and Dynamics.** Techniques used in the analysis of process dynamics and in the design of process control systems; includes Laplace transforms, stability analysis, and frequency response methods. Laboratory emphasizes on-line data acquisition and control. Prerequisite: Credit or registration in Chemical Engineering 371; Mathematics 345; Computer Science 101. 2 or 3 hours, or 1/2 or 3/4 unit.
390. **Individual Chemical Engineering Projects.** Laboratory; development of an individual project. Prerequisite: Senior standing in chemical engineering. 2 hours or 1/2 unit.
396. **Special Topics in Chemical Engineering.** Study of selected topics in chemical engineering; content varies from semester to semester. Typical topics are optimization, chemical kinetics, phase equilibrium, biochemical engineering, kinetic theory, and transport properties. Prerequisite: Senior standing in chemical engineering or consent of instructor. 2 or 3 hours, or 3/4 or 1 unit. May be repeated for credit.
465. **Chemical Engineering Seminar.** Required of all graduate students whose major is chemical engineering. Prerequisite: Chemical Engineering 373. 1/4 unit.
466. **Applied Mathematics in Chemical Engineering.** The development of mathematical models and a survey of modern mathematical methods currently used in the solution of chemical engineering problems; topics include the application of vectors and matrices, partial differential equations, numerical analysis, and methods of optimization in chemical engineering. Prerequisite: Consent of instructor. 3/4 or 1 unit.
468. **Properties of Fluids.** The kinetic theory of gases and the prediction of transport coefficients; statistical mechanics applied to dense gases and liquids; and theories of solutions. Prerequisite: A background in modern physical chemistry and physics; consent of instructor. 3/4 or 1 unit.
469. **Special Topics in Chemical Engineering.** Various advanced topics; generally taken during the second year of graduate study. Typical topics include turbulence, hydrodynamic instability, process dynamics, interfacial phenomena, reactor design, properties of matter at high pressure, and phase transitions. Prerequisite: Consent of instructor. 3/4 or 1 unit. May be repeated.
487. **Fluid Dynamics.** Basic concepts in fluid dynamics with special emphasis on topics of interest to chemical engineers; derivation of the Navier-Stokes equations; solutions for creeping flow, for perfect fluids, and for boundary layers; non-Newtonian fluids; and turbulence. Prerequisite: Consent of instructor. 1 unit.
488. **Advanced Topics in Heat and Mass Transfer.** Principles of transfer operations developed in terms of physical rate processes; boundary layer heat and mass transfer, eddy diffusion, phase changes, and separation processes. Prerequisite: Consent of instructor. 3/4 or 1 unit.

496. **Individual Study.** Study under the supervision of a staff member in areas not covered in course offerings. Prerequisite: Consent of the staff member under whom the study is to be made. 0 to 1 unit.
497. **Special Problems.** Individual work on problem-oriented projects not included in theses. This could be research, engineering design, or professional work in chemical engineering which has educational values. The work must be done under the supervision of a staff member with the approval of the department head. 1/2 to 4 units.
498. **Research Seminar.** Discussion of recent developments of importance to different areas of chemical engineering research. The course is divided into a number of sections, and subject matter differs from section to section and from time to time. Prerequisite: Consent of instructor. 0 to 1 unit. May be repeated for credit.
499. **Thesis Research.** Candidates for the master's degree who elect research are required to write a thesis. A thesis is always required for the Doctor of Philosophy. Not all candidates for thesis work necessarily are accepted. Any student whose major is in another department must receive permission from the head of the Department of Chemical Engineering to register in this course. 0 to 4 units

CHEMICAL SCIENCES, SCHOOL OF

(Please refer to individual alphabetical listings: Biochemistry, Chemical Engineering, and Chemistry.)

Director of School: Professor H. S. Gutowsky

School Office: 106 Noyes Laboratory, 505 South Mathews, Urbana

CHEMISTRY

Head of Department: Professor H. S. Gutowsky

Department Office: 106 Noyes Laboratory, 505 S. Mathews, Urbana

100. **Introductory Chemistry.** Introduction to the basic concepts and language of chemistry; lectures, recitations, and audiotutorial laboratory. Prerequisite: Two and one-half units in high school mathematics, or credit or concurrent registration in Mathematics 111 or 112. Only students without high school chemistry or with chemistry placement scores inadequate for enrollment in Chemistry 101 receive graduation credit; students with designated borderline placement into Chemistry 101 may take Chemistry 100 but will not receive credit toward graduation. 2 hours

NOTE: Chemistry 101, 102, 104, and 122 or 123 constitutes the standard college chemistry sequence. Chemistry 107, 109, 108, and 110 is the intensive, more rigorous sequence for chemistry majors and well-prepared students of science. The regular and intensive sequences are not designed to be mixed. A student who registers for parts of both sequences without special permission from the director of general chemistry risks loss of credit. Chemistry 101, 103, and 104 constitutes a terminal sequence for agriculture students which does not satisfy prerequisites for advanced chemistry students.

101. **General Chemistry.** Lecture and laboratory. For students who have some prior knowledge of chemistry. Principles governing atomic structure, bonding, states of matter, stoichiometry, and chemical equilibrium; descriptive chemistry of the elements and coordination compounds. Prerequisite: Credit in or exemption from Mathematics 111 or 112; one year of high school chemistry or equivalent. Placement into 101 by the Chemistry Placement Test recommended. 4 hours. Students may not receive credit for both Chemistry 101 and Chemistry 107 and 109. Students

exhibiting satisfactory performance on a proficiency examination will be granted three semester hours credit for the lecture portion of the course.

102. **General Chemistry (Biological or Physical Version).** Lectures, recitations, and laboratory. Section B (Biological Version): Chemistry of organic and biochemical systems, chemical energetics and equilibrium, chemical kinetics, and reaction mechanisms. Section P (Physical Version): Chemistry of materials, including organic and biological substances, chemical energetics and equilibrium, chemical kinetics, and solids and crystals. Prerequisite: Chemistry 101, or Chemistry 107 and 109, or advanced placement credit for one semester of college-level chemistry. 4 hours. Students may not receive credit for both Chemistry 102 and Chemistry 108 and 110. Students exhibiting satisfactory performance on a proficiency examination will be granted three semester hours credit for the lecture portion of the course.
103. **General Chemistry: Organic Chemical Studies.** Lectures, recitations, and laboratory-discussion. Descriptive facts and theory of organic chemistry and applications to living processes. For students in the College of Agriculture. A terminal course in chemistry; it does not meet the Chemistry 102 prerequisite for more advanced courses in chemistry. Prerequisite: Chemistry 101. 4 hours.
104. **General Chemistry Laboratory.** Laboratory and laboratory- discussion. Introduction to the techniques of the chemical laboratory, quantitative analysis, qualitative analysis, and synthesis. To be taken concurrently with Chemistry 102. Prerequisite: Chemistry 101 and credit or concurrent registration in Chemistry 102 or 103. 2 hours.
107. **Accelerated Chemistry, I.** Lectures and recitations. The beginning chemistry course for students in the chemical sciences and others with strong high school chemistry and mathematics preparation. Quantitative chemical calculations, structure, bonding, equilibrium, descriptive chemistry of the elements, and coordination compounds. Credit toward graduation is received for Chemistry 107 only if Chemistry 109 is also completed. Prerequisite: Admission by U. of I. placement test or consent of adviser; credit or concurrent registration in Mathematics 120 or 135; concurrent registration in Chemistry 109. 3 hours.
108. **Accelerated Chemistry, II.** Continuation of Chemistry 107. Lectures and recitations. Emphasizes chemical thermodynamics, equilibrium, and chemical kinetics. Credit toward graduation is received for Chemistry 108 only if Chemistry 110 is also completed. Prerequisite: Chemistry 107 and/or 109 and concurrent registration in Chemistry 110, or consent of instructor. 3 hours.
109. **Accelerated Chemistry Laboratory, I.** Laboratory and discussion. Includes quantitative and qualitative analysis. Prerequisite: Concurrent registration in Chemistry 107, or receipt of credit by examination for Chemistry 107, or consent of department. 2 hours. No two of Chemistry 109, 122, and 123 may be taken for credit.
110. **Accelerated Chemistry Laboratory, II.** Laboratory and discussion. Includes experiments in inorganic synthesis, kinetics, and thermodynamics, as well as an individual project. Prerequisite: Concurrent registration in Chemistry 108 or consent of department. 2 hours.
122. **Elementary Quantitative Analysis.** Theory and practice of equilibria pertinent to chemical analyses; practical applications of classical and instrumental methods of analysis. Intended primarily for students outside the School of Chemical Sciences. Prerequisite: Chemistry 102 or equivalent. 3 hours. No two of Chemistry 109, 122, and 123 may be taken for credit.
123. **Quantitative Analysis.** Theory and application of chemical equilibria and instrumentation in analysis. Intended primarily for students majoring in departments within the School of Chemical Sciences. Prerequisite: Chemistry 102 or equivalent. 3 hours. No two of Chemistry 109, 122, and 123 may be taken for credit.
131. **Elementary Organic Chemistry.** Basic structural and synthetic organic chemistry is presented with emphasis on applications of this material to closely related areas. For students in agricultural science, dairy technology, food technology, nutrition, dietetics, premedical, pre dental, and preveterinary courses. Prerequisite: Chemistry

- 102 or 108. 3 hours. Students may not receive credit for both Chemistry 131 and Chemistry 136.
134. **Elementary Organic Chemistry Laboratory.** Basic laboratory technique in organic chemistry is presented with emphasis on experiments of interest to closely related areas. For students in agricultural science, dairy technology, food technology, nutrition, dietetics, premedical, pre dental, and preveterinary courses. Prerequisite: Credit or concurrent registration in Chemistry 131. 2 hours. Students may not receive credit for both Chemistry 134 and 181.
136. **Basic Organic Chemistry.** Fundamental structural, synthetic, and mechanistic organic chemistry is presented. For students whose major is chemistry or for those registering in the curriculum in chemistry or chemical engineering. Prerequisite: Chemistry 108, 122, or 123; concurrent registration in Chemistry 181; Mathematics 130, 131, or 135. 3 hours. Students may not receive credit for both Chemistry 136 and 131.
181. **Structures and Synthesis.** A laboratory course emphasizing molecular structure and synthetic chemistry. Prerequisite: Chemistry 108, 122, or 123; Mathematics 130, 131, or 135; credit or concurrent registration in Chemistry 136. 2 hours. Students may not receive credit for both Chemistry 181 and 134.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Cooperative Education: Planning.** Same as Chemical Engineering 201. On-campus planning and discussion of cooperative work-study education programs in industry and government. Each chemistry or chemical engineering student participating in the cooperative education program must register for Chemistry/Chemical Engineering 201 or 202 each term (201 if on-campus, 202 if off-campus). Prerequisite: Acceptance into the School of Chemical Sciences Cooperative Education Program. 0 credit.
202. **Cooperative Education: Industrial Practice.** Same as Chemical Engineering 202. Off-campus cooperative practice of chemistry or chemical engineering in industrial or governmental facilities. Each chemistry or chemical engineering student participating in cooperative education must register for Chemistry/Chemical Engineering 202 for each off-campus term. Prerequisite: Acceptance into the School of Chemical Sciences Cooperative Education Program. 0 credit.
245. **Physical Chemistry for Engineers.** Same as Ceramic Engineering 245. See Ceramic Engineering 245.
292. **Senior Thesis.** Research, with thesis, under the direction of a senior staff member in chemistry. Normally the student takes two semesters of Chemistry 292 in the senior year. Chemistry 292 is recommended for all those who plan to do research and graduate study, and it or Biochemistry 292 is a prerequisite for graduation with distinction in chemistry. In the semester preceding their initial enrollment, those interested in taking the course should consult with their advisers and with the graduate adviser for the area of interest in which they plan to work. A maximum of 10 hours may be counted toward graduation and a thesis must be presented for credit to be received. 2 to 6 hours.
315. **Inorganic Chemistry.** Electronic structure of atoms and molecules and their relation to the properties of the elements and compounds; types of bonding; and a survey of symmetry, group theory, ligand field theory, organo-metallic chemistry, acids and bases, nonaqueous solvents, homogeneous catalysts, and bioinorganic chemistry. Prerequisite: Credit or concurrent registration in Chemistry 342. 3 hours or 3/4 unit.
316. **Inorganic Chemistry Laboratory.** Preparation of typical inorganic compounds illustrating special and advanced techniques, including characterization by modern physical methods. Prerequisite: Chemistry 383, or credit or concurrent registration in Chemistry 315, or equivalent. 3 hours or 3/4 unit.
322. **Separation Methods.** Examines theory, practice, and instrumentation in gas and liquid chromatography, extraction techniques, mass spectrometry as coupled to chromatography, electrophoresis, and separations based on phase equilibria.

Prerequisite: Credit or concurrent registration in Chemistry 340 or 342. 4 hours or 1 unit.

323. **Applied Electronics for Scientists.** A lecture and laboratory course designed expressly for chemists and other scientists or engineers who have little or no background in electronics, but who need a working knowledge of electronic devices, circuits, and instruments; begins with electronic principles and leads systematically into digital, analog, and servo systems used in scientific instrumentation. Prerequisite: Senior or graduate standing in any of the physical sciences or engineering, or consent of instructor. 4 hours or 1 unit.
328. **Principles of Environmental Chemistry.** Presentation of the chemical principles underlying air and water chemistry with strong emphasis on the behavior of environmental pollutants; detailed discussion of the chemistry of production of pollutants and their effects. Prerequisite: Chemistry 340, or Chemistry 336 and Physics 102, or consent of instructor. 3 hours or 3/4 unit.
329. **Instrumental Methods of Analysis.** Studies instrumental methods for characterization of chemical systems: potentiometry, voltammetry, atomic spectroscopy, molecular absorption and fluorescence, mass spectrometry, activation analysis, electron and x-ray spectroscopies, gas and liquid chromatography, and current topics such as laser spectroscopy. Prerequisite: Chemistry 340; or credit or concurrent registration in Chemistry 342; or consent of instructor. 4 hours or 1 unit.
336. **Organic Chemistry.** Second course; lectures. Prerequisite: Chemistry 131 and 134, or Chemistry 136 and 181. 3 hours or 3/4 unit.
337. **Organic Chemistry.** Laboratory experiments in organic chemistry with emphasis on synthesis. Prerequisite: Credit or concurrent registration in Chemistry 336. 3 hours or 3/4 unit.
338. **Separation, Purification, and Identification of Organic Compounds.** Separation, purification, and identification of organic compounds using modern research methods; the identification of organic compounds by the use of spectroscopic methods and chemical conversion; the separation of mixtures and the purification of the components by crystallizations, sublimation, distillation, extraction, and chromatography; and the qualitative and quantitative identification of the components of a mixture. Prerequisite: Chemistry 336 and 337. 4 hours or 1 unit.
339. **Advanced Organic Chemistry.** Interpretation of reactivity, reaction mechanisms, and intermediates; applications in organic synthesis, photochemistry, biosynthesis of natural products, and other areas. Prerequisite: Chemistry 338. 3 hours or 3/4 unit.
340. **Principles of Physical Chemistry.** A one-semester course in physical chemistry emphasizing topics most important to students in the biological and agricultural sciences. Not open to students in the specialized curricula in chemistry and chemical engineering. Laboratory experience in this area provided by Chemistry 383 to be taken preferably after Chemistry 340. Prerequisite: Chemistry 122 or 123 and Chemistry 131, or equivalent; Physics 102; Mathematics 130 or equivalent (calculus including partial derivatives). 4 hours or 1 unit.
342. **Physical Chemistry, I.** Lectures and problems focusing on microscopic properties. Chemistry 342 and 344 constitute a year-long study of chemical principles covering topics such as quantum chemistry, atomic and molecular structure and spectra, statistical thermodynamics, properties and thermodynamics of materials in gases, solids, and liquids, and chemical kinetics and equilibria. Prerequisite: Chemistry 108, 122, or 123; Mathematics 240 or equivalent; Physics 106, 107, and 108 or equivalent. 4 hours or 1 unit.
344. **Physical Chemistry, II.** Continuation of Chemistry 342, focusing on bulk properties. Prerequisite: Chemistry 342. 4 hours or 1 unit.
346. **Physical Chemistry of Macromolecules.** The physical properties of systems containing large molecules, with special emphasis on proteins, nucleic acids, and high polymers; the use of physical methods for the characterization of such substances. Prerequisite: Chemistry 340 or 344. 3 hours or 3/4 unit. Credit may not be received for both Chemistry 346 and Physics 350.

348. **Advanced Physical Chemistry.** The sequence, Chemistry 348 and 349, is designed to give seniors and graduate students a unified treatment of physical chemistry on an advanced level; topics include the electronic structure and spectra of atoms, principles of wave mechanics, experimental and theoretical aspects of the chemical bond in diatomic and polyatomic molecules, statistical thermodynamics, and chemical kinetics. Prerequisite: Chemistry 344 or equivalent. 4 hours or 1 unit.
349. **Advanced Physical Chemistry.** Continuation of Chemistry 348. Prerequisite: Chemistry 348. 4 hours or 1 unit.
383. **Dynamics, Structure, and Physical Methods.** Laboratory presenting the relationship of dynamics and structure with emphasis on the use of physical methods to follow the course of reactions. Prerequisite: Chemistry 181 or 134; credit or concurrent registration in Chemistry 342, or credit in Chemistry 340. 2 hours or 1/2 unit.
385. **Chemical Fundamentals.** Laboratory with experiments on the fundamental physical nature of chemical phenomena. Prerequisite: Chemistry 342 and 383; credit or concurrent registration in Chemistry 344. 4 hours or 1 unit.
390. **History of Chemistry.** Selected topics in the intellectual and social history of chemistry from antiquity to the present, viewed within the context of broader scientific and cultural developments. Prerequisite: Technical background commensurate with that of juniors in chemistry or allied sciences; or, with consent of instructor, junior standing in history and philosophy of science or other disciplines. 2 hours or 1/2 unit.
392. **Solid State Structural Analysis.** Lectures and laboratory on various aspects of x-ray diffraction studies of solids; topics include the properties of crystals, symmetry, diffraction techniques, data collection methods, and the determination and refinement of crystal structures. Prerequisite: Chemistry 342 or consent of instructor. 4 hours or 1 unit.
397. **Radiochemistry.** Same as Nuclear Engineering 397. Properties of radioactive nuclei, nature of radioactivity, nuclear structure, nuclear reactions, interactions of radiations with matter, chemical aspects of radioactivity work, and applications of nucleonics to chemistry. Prerequisite: One semester of physical chemistry or one semester of atomic physics, or consent of instructor. 3 hours or 3/4 unit.
398. **Radiochemistry Laboratory.** Same as Nuclear Engineering 398. To accompany Chemistry 397. Radioactivity detection and tracer applications of radioisotopes in chemistry and other fields. Laboratory and discussion. Prerequisite: One semester of physical chemistry or one semester of atomic physics, or consent of instructor. 2 hours or 1/2 unit.
404. **Advanced Inorganic Chemistry Laboratory.** Specialized laboratory techniques; more difficult inorganic syntheses. Prerequisite: Credit or concurrent registration in one of the lecture courses in inorganic chemistry in the 400 series. 1/4 to 3/4 unit.
405. **Inorganic Chemistry Seminar.** Required of all graduate students whose major is inorganic chemistry. 1/4 unit.
406. **Physical Inorganic Chemistry.** Includes group theory and use of physical methods to provide information about the geometry, electronic structures, and reactivity of inorganic compounds in solution; emphasizes nmr and esr. Prerequisite: Chemistry 344. 1 unit.
407. **Special Topics in Inorganic Chemistry.** An advanced course dealing with a subject not ordinarily covered by regularly scheduled courses, such as organometallic chemistry, advanced ligand field theory and molecular orbital theory of inorganic compounds, kinetics and mechanisms of inorganic reactions, etc. Prerequisite: Chemistry 406 or consent of instructor. 1/2 to 1 unit. May be repeated for credit.
421. **Spectrochemical Methods of Analysis.** Principles and applications of spectroscopic measurements and instrumentation; atomic emission, absorption, and fluorescence; ultraviolet, visible, and infrared absorption spectroscopy; molecular fluorescence and phosphorescence; Raman spectroscopy; and other spectrometric methods. Prerequisite: General physics and chemistry equivalent to a major in physical

sciences for a bachelor's degree. 1/2 or 1 unit. (Lecture, 1/2 unit; lecture and laboratory, 1 unit.)

422. **Electrical Methods of Chemical Analysis.** Polarography, potentiometric, amperometric, and conductometric titrations, and other selected topics. Lectures and laboratory. Prerequisite: Chemistry 344 or equivalent. 1 unit.
424. **Special Topics in Analytical Chemistry.** Recent advances in measurement science and the application of analytical chemistry to other sciences; designed to acquaint students with techniques and applications not covered in other courses. Prerequisite: Consent of instructor. 1/2 unit. May be repeated.
425. **Analytical Chemistry Seminar.** Required of all graduate students whose major is analytical chemistry. 1/4 unit.
430. **Advanced Organic Chemistry: Structure and Spectroscopy.** Advanced survey of organic chemistry with emphasis on structure and spectroscopy. Prerequisite: Chemistry 336. 1 unit.
431. **Advanced Organic Chemistry: Reaction Mechanisms.** Advanced survey of organic chemistry with emphasis on reaction mechanisms and concepts of physical organic chemistry. Prerequisite: Chemistry 336 and one year of physical chemistry. 1 unit.
432. **Advanced Organic Chemistry: Synthesis.** Advanced survey of organic chemistry with emphasis on synthesis. Prerequisite: Chemistry 336. 1 unit.
433. **Organic Chemistry.** Special topics in organic chemistry. An advanced course dealing with a subject not ordinarily covered by regularly scheduled courses, such as natural product synthesis and biosynthesis, organic photochemistry, chemistry of special families of organic compounds, etc. Prerequisite: Chemistry 431 and 432, one of which may be taken concurrently. 1/2 or 3/4 unit. Two lectures per week are required for 3/4 unit credit. May be repeated for credit.
435. **Organic Chemistry Seminar.** Current literature in organic chemistry. Prerequisite: Consent of instructor. 1/2 unit.
436. **Experimental Organic Chemistry.** A lecture course on research techniques in organic chemistry. Prerequisite: Consent of instructor. 1/4 unit.
440. **Research Topics in Biophysical Chemistry.** Same as Biochemistry and Biophysics 440. Topics of importance in research in biophysical chemistry are discussed with emphasis on physical background and current applications; topics may be chosen from among the following: NMR and ESR spectra of biological macromolecules; x-ray diffraction studies of macromolecules; kinetics and statistical mechanics of helix coil transitions; physical approaches to the refolding and assembly of multi-subunit proteins; fluorescence spectroscopic studies on macromolecules; and light scattering from macromolecules in solution. Prerequisite: Chemistry 344 or equivalent, or Chemistry 346. 1 unit.
441. **Thermodynamics and Statistical Thermodynamics.** Fundamentals of classical thermodynamics with emphasis on equilibrium and stability criteria; an introduction to equilibrium statistical mechanics with discussion of several ensembles and applications to ideal systems of interest to chemists; and introduction to nonequilibrium thermodynamics. Prerequisite: Chemistry 342 and 344, or equivalent. 1 unit.
442. **Statistical Mechanics.** Fundamentals of equilibrium statistical mechanics with selected applications to interacting classical fluids: dense gases, solutions, liquids, plasmas, and ionic solutions; introduction to nonequilibrium statistical mechanics and linear response theory. Prerequisite: Chemistry 348 and 441, or equivalent, or consent of instructor. 1 unit.
443. **Quantum Dynamics.** The quantum mechanical description of time-dependent processes, including discussions of the time-dependent Schrodinger equation, approximations, interaction of matter with radiation, wave packets, elastic and inelastic scattering, and relaxation phenomena. Prerequisite: Concurrent registration in Chemistry 348 or consent of instructor. 1 unit.
445. **Physical Chemistry Seminar.** Required of all graduate students whose major is physical chemistry. Prerequisite: Consent of instructor. 1/4 or 1/2 unit.

- 446. Molecular Electronic Structure.** The theoretical basis of the electronic structure of atoms and molecules; molecular orbital concepts and self-consistent field theory; angular momentum and the full rotation group; electron correlation effects; and applications to electronic spectroscopy of organic molecules, detailed descriptions of chemical reactions, and molecular properties. Prerequisite: Chemistry 348. 1 unit.
- 448. Chemical Kinetics.** Theoretical and experimental topics in chemical kinetics and chemical dynamics; topics include relation between rates and mechanisms of chemical reactions, collision theory of reaction rates, activated complex theory, theory of unimolecular processes, classical dynamics of reactive scattering, elastic scattering, quantum theory of inelastic scattering or equivalent curve crossing processes, and experimental methods. Prerequisite: Chemistry 344. 1 unit.
- 449. Special Topics in Physical Chemistry.** An advanced course dealing with a subject not ordinarily covered by regularly scheduled courses, such as molecular spectroscopy, statistical mechanics, radiation and hot-atom chemistry, molecular quantum mechanics, radio-frequency spectroscopy, advanced experimental methods, kinetics of irreversible processes and cooperative phenomena, etc. Prerequisite: Consent of instructor. 1/2 or 1 unit. Students may register for credit more than once.
- 490. Special Topics in Chemistry.** Designed for students majoring or minoring in chemistry who wish to undertake individual studies of a non-research nature under the direction of a faculty member of the department. Prerequisite: Consent of instructor and written approval of department head. Staff for the course is the same as for Chemistry 499. 1/4 to 1 unit.
- 494. Chemical Basis of Biological Specificity.** Same as Biochemistry 494. See Biochemistry 494.
- 496. Carbon and Hydrogen Tracer Methodology.** Comprehensive study of the tracer methodology concerned with the use of carbon-13, carbon-14, hydrogen-2, and hydrogen-3 in chemical research. Prerequisite: Chemistry 337 or consent of instructor. 3/4 unit.
- 499. Thesis Research.** A candidate for the master's degree who elects research is required to present a thesis. A thesis is always required of students working toward the degree of Doctor of Philosophy. Not all candidates for thesis work necessarily are accepted. Any student whose major is in a department other than chemistry or chemical engineering must receive permission from the head of the School of Chemical Sciences to register in this course. 0 to 4 units

CHINESE

(See Asian Studies)

Cinematography

(See Art and Design)

CIVIL ENGINEERING

Head of Department: Professor J. C. Liebman

Department Office: 1114 Civil Engineering Building, 208 North Romine, Urbana

- 195. Introduction to Civil Engineering.** A civil engineering orientation course including historical developments, educational requirements, relation to science, professional practice, and specialties within the profession. Prerequisite: Sophomore standing in civil engineering. 1 hour.

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Engineering Surveying.** Introduction to surveying and photogrammetry. Prerequisite: Civil Engineering 293; credit or registration in Computer Science 101. 4 hours.
205. **Route Surveying and Design.** Principles for the design and layout of routes; coverage includes horizontal and vertical alignment, route location, earthwork, computation, ground and photogrammetric survey methods, and special survey methods for highways, railroads, pipelines, tunnels and urban construction. Prerequisite: Civil Engineering 201 or consent of instructor. 3 hours.
214. **Properties and Behavior of Concrete.** Engineering properties of plain concrete; influence of cement, aggregates, water, and admixtures on the properties of fresh and hardened concrete; microstructure of cement paste and concrete; mix design; handling of fresh concrete; and behavior under various types of loading and environments. Laboratory practice is an important part of the course. Prerequisite: Theoretical and Applied Mechanics 221. 3 hours.
216. **Construction Engineering.** Introduction to the construction processes: contracting and bonding, planning and scheduling, estimating and project control, scientific productivity models, and construction econometrics. Prerequisite: Civil Engineering 292; credit or concurrent registration in Computer Science 101 and Civil Engineering 293. 3 hours.
220. **Materials for Transportation Facilities.** Materials for the construction of transportation roadways including soils, aggregates, soil-aggregates, bituminous materials, asphaltic mixtures, and stabilized soils; emphasis on properties, behavior, mixture analysis, and quality control. Prerequisite: Theoretical and Applied Mechanics 221 or consent of instructor. 3 hours.
230. **Introduction to Transportation Engineering and Planning.** Same as Urban and Regional Planning 230. Introduction to engineering and planning principles applicable to all types of transportation systems; technological characteristics of transportation modes; economic and environmental concepts applied to transportation; and design, planning, and management of transportation facilities, operations, and maintenance. Prerequisite: Civil Engineering 292, Computer Science 101, Economics 101, or equivalent. 3 hours.
241. **Air and Water Quality.** Sources and types of air and water pollution; measurement of air and water quality; effects of pollutants on the environment; transport and ultimate fate of pollutants; environmental quality standards; and methods of pollution control and abatement. Prerequisite: Credit or concurrent registration in Theoretical and Applied Mechanics 235; Chemistry 102. 3 hours.
255. **Introduction to Hydrosystems Engineering.** Quantitative aspects of water in the earth's environment and its engineering implications, including design and analysis of systems directly concerned with use and control of water; presents a quantitative introduction to hydrology, hydraulic engineering, and water resources planning. Prerequisite: Civil Engineering 293 or a course in probability or statistics; credit or registration in Theoretical and Applied Mechanics 235 and Civil Engineering 292, or equivalent. 3 hours.
261. **Introduction to Structural Engineering.** Basic topics in the analysis, behavior and design of trusses and framed structures under static loads; analysis topics including member forces in trusses, shear and moment diagrams, deflections, simple applications of the force method and slope-deflection; and an introduction to computer applications by means of a general purpose structural analysis program. Prerequisite: Theoretical and Applied Mechanics 221. 3 hours.
262. **Analysis of Framed Structures.** Comprehensive study of the force and displacement methods of analysis of framed structures; influence functions; curves of maxima; and use of computer structural analysis programs. Prerequisite: Civil Engineering 261. 3 hours.
263. **Behavior and Design of Metal Structures, I.** Introduction to the design of metal structures; behavior of members and their connections; and theoretical, experimental,

- and practical bases for proportioning members. Prerequisite: Civil Engineering 261 or consent of instructor. 3 hours.
264. **Reinforced Concrete Design, I.** Study of the strength, behavior, and design of reinforced concrete members subjected to moments, shear, and axial forces; extensive discussion of the influence of the material properties on behavior. Prerequisite: Civil Engineering 261. 3 hours.
280. **Introduction to Soil Mechanics and Foundation Engineering.** Classification of soils, compaction in the laboratory and in the field, soil exploration, boring and sampling, one-dimensional settlement analyses, strength, bearing capacity of foundations, and stability of retaining walls and slopes. Prerequisites: Theoretical and Applied Mechanics 221. 3 hours.
290. **Legal Aspects of Engineering Contracts and Specifications.** Same as General Engineering 290. See General Engineering 290.
292. **Planning, Design, and Management of Civil Engineering Systems.** Introduction to the formulation and solution of civil engineering problems; engineering economics, mathematical modeling, optimization, and simulation; and techniques including classical optimization, linear programming, networks, critical path method, dynamic programming, and decision theory. Prerequisite: Mathematics 240 or 241, or equivalent. 3 hours.
293. **Stochastic Concepts in Civil Engineering.** Identification and modeling of nondeterministic problems in civil engineering, and the treatment thereof relative to engineering design and decision making; development of stochastic concepts and simulation models, and their relevance to real design and decision problems in various areas of civil engineering. Prerequisite: Integral calculus. 3 hours.
295. **Professional Practice.** A series of lectures by outstanding authorities on the practice of civil engineering and its relations to economics, sociology, and other fields of human endeavor. Lectures are given approximately once a week. Prerequisite: Junior standing. 0 credit.
307. **Photogrammetric Engineering.** Study of metrical photography in civil engineering practice; analytical and analogue photogrammetric systems; photometrics and outer space mapping techniques; and automated photographic mapping systems. Prerequisite: Civil Engineering 201 or consent of instructor. 3 hours, or 3/4 or 1 unit.
309. **Geodetic Engineering.** Examines instrumentations, field, and computation methods for boundary surveys; astronomical determination of positions and directions; precise horizontal and vertical controls for small and large area engineering construction; stability and deformation measurements; and off-shore positioning. Prerequisite: Civil Engineering 201 or consent of instructor. 3 hours, or 3/4 or 1 unit.
310. **Construction Materials.** An intermediate level materials course which considers the molecular structure/mechanical property relationships for construction materials (metals, ceramic materials, and polymeric materials), as well as the response of those materials to service stresses and environments. Prerequisite: Theoretical and Applied Mechanics 224 or equivalent. 3 hours or 3/4 unit.
314. **Advanced Concrete Technology.** Advanced course on the properties of plain concrete as a composite material; emphasizes the importance of the chemical and physical properties of cement paste in determining the properties of concrete; and discusses recent advances in the science and technology related to concrete performance. Prerequisite: Civil Engineering 214. 3 or 4 hours, or 3/4 or 1 unit.
315. **Construction Productivity.** Introduction to the application of scientific principles to the measurement and forecasting of productivity in construction engineering; conceptual and mathematical formulations of the labor, equipment, and material factors affecting productivity. Prerequisite: Civil Engineering 216 or consent of instructor. 3 hours, or 3/4 or 1 unit.
316. **Construction Planning and Control.** Project definition; scheduling and control models; material, labor, and equipment allocation; optimal schedules; project organization; documentation and reporting systems; and management and control.

Prerequisite: Civil Engineering 216 or consent of instructor. 3 hours, or 3/4 or 1 unit.

318. **Construction Cost Analyses and Estimates.** Introduction to the application of scientific principles to costs and estimates of costs in construction engineering; concepts and statistical measurements of the factors involved in direct costs, general overhead costs, cost markups and profits; and the fundamentals of cost recording for construction cost accounts and cost controls. Prerequisite: Civil Engineering 216 or consent of instructor. 3 hours, or 3/4 or 1 unit.
320. **Pavement Analysis and Design, I.** Analysis, behavior, performance, and structural design of pavements for highways and airfields; topics include climate factors, rehabilitation, life cycle design economics, and traffic loadings. Prerequisite: Civil Engineering 220 or equivalent. 3 hours, or 3/4 or 1 unit.
321. **Bituminous Materials and Mix Design.** Properties and control testing of bituminous materials, aggregates for bituminous mixtures, and analysis and design of asphalt concrete and liquid asphalt cold mixtures; structural properties of bituminous mixes; surface treatment design; and recycling of mixtures. Prerequisite: Civil Engineering 220 or consent of instructor. 3 hours, or 3/4 or 1 unit.
322. **Development of Highway Facilities.** Analysis of factors in developing a highway transportation facility; traffic estimates and assignment; problems of highway geometrics and design standards; planning and location principles; intersection design factors; street systems and terminal facilities; programming improvements; drainage design; structural design of surface; concepts of highway management and finance; and highway maintenance planning. Prerequisite: Civil Engineering 220 or consent of instructor. 4 hours or 1 unit.
325. **Highway Traffic Characteristics.** Vehicle operating characteristics, driver characteristics, pedestrian characteristics, and roadway characteristics; their individual and collective relationships as traffic stream characteristics to the planning, design, and operation of highway facilities. Prerequisite: Civil Engineering 230 or consent of instructor. 3 hours or 1/2 unit.
330. **Urban Transportation Planning.** Same as Urban Planning 330. See Urban Planning 330.
331. **Regional Transportation Planning.** Same as Urban Planning 331. Examines transportation systems for regions larger than urban areas through theoretical models linking the economic and political realities of present freight and passenger services at state, interstate, and national levels; considers competition among agencies and travel modes in light of federal regulations and technological developments. Term paper required for 1 unit credit. Prerequisite: Civil Engineering 230, or Urban Planning 332 or equivalent. 3 hours, or 3/4 or 1 unit.
334. **Airport Design.** Basic principles of site selection for airports and fundamental considerations of design, construction, and maintenance of airport pavements and structures. Prerequisite: Civil Engineering 220 and senior standing in civil engineering, or consent of instructor. 3 hours, or 1/2 or 1 unit.
339. **Environmental Systems Analysis, I.** Examines principles of environmental engineering design: applications to mathematical methods, including single and multi-objective programming, to environmental systems; economic analysis, including benefit-cost; and management strategies. Prerequisite: Civil Engineering 292; and Civil Engineering 342 or 349. 3 hours or 3/4 unit.
340. **Physical Principles of Environmental Engineering Processes.** Analysis of the physical principles which form the basis of many water and air quality-control operations; sedimentation, filtration, inertial separations, flocculation, and mixing and principles of reactor design. Prerequisite: Civil Engineering 342 or consent of instructor. 3 hours or 3/4 unit.
341. **Air Resources Management.** Same as Environmental Studies 341. Examination of the management of the air resources for a large urban area using dynamic operational gaming simulation techniques; focus on the law, technology, administration, and politics associated with the control of air resources. Prerequisite:

Senior or graduate standing, or consent of instructor and credit in an introductory course in air pollution control. 2 hours or 1/2 unit.

342. **Water Quality Control Processes.** Fundamental theory underlying the unit processes utilized in the treatment of water for domestic and industrial usage, and in the treatment of domestic and industrial wastewaters. Prerequisite: Credit or concurrent registration in Civil Engineering 241. 3 hours or 3/4 unit.
343. **Chemical Principles of Environmental Engineering Processes.** Application of principles of chemical equilibrium, surface chemistry, chemical kinetics, and photochemistry to air and water quality considerations; carbonate and phosphate systems in natural waters; dissolved gases; hardness; hydrolysis of coagulants; corrosion; chemistry of disinfectants; removal of impurities by adsorption; and reactions of various pollutants in the atmosphere. Prerequisite: Civil Engineering 342 or consent of instructor. 3 or 4 hours, or 3/4 or 1 unit.
344. **Solid Waste Management.** Analysis of the sources, quantities, and characteristics of solid waste; effect of refuse on the environment; establishment and operation of collection and transportation systems, material recovery systems, energy recovery systems, and ultimate disposal systems. A term project is required of all graduate students. Prerequisite: Civil Engineering 241 or consent of instructor. 3 hours or 1 unit.
345. **Atmospheric Dispersion Modeling.** Application of the fundamentals of meteorology to air pollution problems including the transport and diffusion of particulate matter, aerosols and gases; precipitation processes and rain-out; behavior of stack effluents; effects of pollutants in the atmosphere. Prerequisite: Theoretical and Applied Mechanics 235 and Mechanical Engineering 205, or equivalent, or consent of instructor. 3 hours, or 3/4 or 1 unit.
346. **Biological Principles of Environmental Engineering Processes.** Application of principles of organic chemistry, biochemistry, and biology to air and water quality, wastes, and their engineering management; biologically mediated changes in water and in domestic and industrial wastewater; biological contaminants of air; and solid waste disposal. Prerequisite: Civil Engineering 342 or consent of instructor. 3 hours or 3/4 unit.
347. **Aquatic Ecology.** Same as Ecology, Ethology, and Evolution 359. Integrated study of the environmental factors affecting the composition and distribution of biota in lakes, rivers, and estuaries; emphasis on the nature of the response of aquatic ecosystems to stress and practical means of aquatic resource management. Prerequisite: Civil Engineering 346 or Ecology, Ethology, and Evolution 343, or consent of instructor. 3 hours or 3/4 unit.
349. **Air Resources Engineering.** Introduction to air pollution; includes the basis for air quality criteria, classification of sources, and the design of systems to control air pollution from stationary sources. Prerequisite: Credit or registration in Civil Engineering 241 or consent of instructor. 3 hours or 3/4 unit.
350. **Hydrology.** An applied course on hydrology dealing with environmental water problems; discussion of principles of hydrologic systems and their components; and presentation of methods of analysis and their applications to various purposes of water resources planning and development. Prerequisite: Civil Engineering 255 or equivalent with consent of instructor. 3 hours, or 3/4 or 1 unit.
351. **Hydromechanics.** Applied incompressible fluid mechanics with particular reference to topics in analysis and research in civil engineering areas; includes continuity, momentum and energy principles, potential flow, laminar motion, turbulence and diffusion, boundary-layer theory, and unsteady flow. Prerequisite: Theoretical and Applied Mechanics 235 or consent of instructor. 3 hours or 3/4 unit. Additional 1/4 unit of credit available to graduate students through registration in Civil Engineering 497 for special course project.
352. **Water Resources Design.** The planning, engineering, and economics of water resources development and project implementation. Prerequisite: Civil Engineering 255 or consent of instructor. 3 hours or 3/4 unit.

353. **Analysis and Design of Hydraulic Systems.** Methodologies for hydraulic analysis and design of engineering systems, including closed conduits and hydraulic structures. Prerequisite: Theoretical and Applied Mechanics 235 or consent of instructor. 3 hours or 3/4 unit. Additional 1/4 unit of credit available to graduate students through registration in Civil Engineering 497 for special course project.
356. **Hydraulics of Surface Drainage.** Application of hydraulic and hydrologic principles; elements of channel design; hydrologic determination of design flow; flow through bridge openings and other obstacles; hydraulics of drainage areas; overland flow; run-off from highways, runways, and urbanized areas; hydraulics of storm-drain systems; and culvert design. Prerequisite: Civil Engineering 255 or consent of instructor. 3 hours, or 3/4 or 1 unit.
357. **Groundwater.** Physical properties of aquifers, modeling of groundwater flow, groundwater hydrology and interrelation with surface water, well hydraulics, pumping tests, and safe yield of aquifers. Prerequisite: Civil Engineering 255 or equivalent. 3 hours or 3/4 unit.
358. **Air Pollution and Combustion.** Same as Mechanical Engineering 333 and Aeronautical and Astronautical Engineering 335. See Aeronautical and Astronautical Engineering 335.
359. **Multiphase Flow Systems.** Same as Mechanical Engineering 303. See Mechanical Engineering 303.
361. **Matrix Analysis of Framed Structures.** A unified formulation of displacement and force methods of analysis including the topological view of the structure as an assemblage of members; matrix techniques of formulation; considerations for automatic computation; and evaluation of truss, grid, and frame models for the response of real structures. Prerequisite: Civil Engineering 262. 3 hours, or 3/4 or 1 unit.
363. **Behavior and Design of Metal Structures, II.** Metal members under combined loads; welded and riveted connections; moment-resistant connections; and plate girders and plastic design concepts. Prerequisite: Civil Engineering 263 or consent of instructor. 3 hours, or 3/4 or 1 unit.
364. **Reinforced Concrete Design, II.** Study of the strength, behavior, and design of indeterminate reinforced concrete structures, with primary emphasis on slab systems; emphasis on the strength of slabs and on the available methods of design of slabs spanning in two directions, with or without supporting beams. Prerequisite: Civil Engineering 262 and 264. 3 hours, or 3/4 or 1 unit.
365. **Design of Structural Systems.** The whole structural design process including definition of functional requirements, selection of structural scheme, formulation of design criteria, preliminary and computer-aided proportioning, and analysis of response, cost, and value. Prerequisite: Civil Engineering 262, and credit in Civil Engineering 263 or 264 with concurrent registration in the other. 3 hours or 1 unit.
368. **Prestressed Concrete.** Study of strength, behavior, and design of prestressed reinforced concrete members and structures, with primary emphasis on pretensioned, precast construction; emphasis on the necessary coordination between design and construction techniques in prestressing. Prerequisite: Civil Engineering 262 and 264. 3 hours, or 3/4 or 1 unit.
369. **Behavior and Design of Wood Structures.** Mechanical properties of wood, stress grades and working stresses; effects of strength-reducing characteristics, moisture content, and duration of loading and causes of wood deterioration; glued-laminated timber and plywood; behavior and design of connections, beams, and beam-columns; design of buildings and bridges; other structural applications: trusses, rigid frames, arches, and pole-type buildings; and prismatic plates and hyperbolic paraboloids. Prerequisite: Civil Engineering 261 and one of: Civil Engineering 262, 263, or 264. 3 hours, or 3/4 or 1 unit.
370. **Structural Reliability and Probabilistic Bases of Design.** Modern probabilistic bases for the design and evaluation of structures and systems, including analysis of structural safety and reliability, and development of probability-based design criteria; quantitative risk evaluation, systematic assessment and analysis of uncertainties,

- safety and load factor determinations, and risk analysis and design for wind storms and earthquakes. Prerequisite: Civil Engineering 261 and 293, or equivalent, or graduate standing, or consent of instructor. 3 hours, or 3/4 to 1 unit.
374. **Introduction to Structural Dynamics.** Analysis of the dynamic response of structures and structural components to transient loads and foundation excitation; single-degree-of- freedom and multidegree-of-freedom systems; response spectrum concepts; simple inelastic structural systems; and introduction to systems with distributed mass and flexibility. Credit is not given for both Civil Engineering 374 and Theoretical and Applied Mechanics 311. Prerequisite: Theoretical and Applied Mechanics 212; Mathematics 345; Civil Engineering 261, or equivalent. 3 hours, or 3/4 or 1 unit.
375. **Welding and Joining Processes.** Same as Metallurgical Engineering 301. See Metallurgical Engineering 301.
378. **Introduction to the Design of Ocean Structures.** Introduction to design and construction of civil engineering structures in the ocean and to associated engineering operations; principal topics include water wave mechanics, engineering oceanography, wave and current forces, and design considerations for fixed and floating structures. Prerequisite: Theoretical and Applied Mechanics 235; Civil Engineering 261; Civil Engineering 293. 3 hours, or 3/4 or 1 unit.
379. **Applied Structural Mechanics.** Study of beams under lateral load; beams with combined lateral load and thrust; beams on elastic foundations; applications of Fourier series and virtual work principles to beam-type structures; stress and strain in three dimensions; applications to flexure of beams and plates; elements of the engineering theory of plates; and torsion of thin-walled open sections. Prerequisite: Mathematics 345 and Civil Engineering 262. 3 hours, or 3/4 or 1 unit.
383. **Soil Mechanics and Soil Properties.** Index properties and engineering classification; water flow and hydraulic properties; stress in soil; stress-strain properties of soils; consolidation; shear strength; properties of natural soil deposits; unsaturated soils; and experimental measurements. Prerequisite: Civil Engineering 280 or equivalent, or consent of instructor. 4 hours or 1 unit.
384. **Applied Soil Mechanics.** Application of soil mechanics to foundations of buildings; stability of earth slopes; earth pressures and retaining walls; braced cuts; and damage due to construction operations. Prerequisite: Civil Engineering 383 or equivalent. 4 hours or 1 unit.
391. **Computer Methods in Civil Engineering.** Review of programming concepts; formulation and programming of numerical, data processing, and logical problems with applications from various branches of civil engineering; organization of programs and data; and development and use of problem-oriented programming languages in civil engineering. Prerequisite: Computer Science 101 or equivalent; senior or graduate standing in civil engineering; or consent of instructor. 3 hours or 1 unit.
393. **Engineering Decision and Risk Analysis.** Development of modern statistical decision theory and risk analysis, and application of these concepts in civil engineering design and decision making; Bayesian statistical decision theory, decision tree, utility concepts, and multiobjective decision problems; modeling and analysis of uncertainties, practical risk evaluation, and formulation of risk-based design criteria, risk benefit trade-offs, and optimal decisions. Prerequisite: Civil Engineering 293 or equivalent, or consent of instructor. 3 hours, or 3/4 to 1 unit.
397. **Independent Study in Civil Engineering.** Individual investigations or studies of any phase of civil engineering selected by the student and approved by the department. Prerequisite: Senior or graduate standing. 1 to 4 hours, or 0 to 4 units.
398. **Civil Engineering Special Topics.** Structured presentations of new and developing areas of knowledge in civil engineering offered by the faculty to augment the formal courses available. Prerequisite: Individually identified for each offering under this course number; see Timetable. 1 to 4 hours, or 1/4 to 1 unit.
416. **Systems Analysis, I: Systems Methodology and Network Techniques.** Same as Industrial Engineering 416. See Industrial Engineering 416.

417. **Systems Analysis, II: Digital Simulation.** Same as Industrial Engineering 417. See Industrial Engineering 417.
420. **Pavement Analysis and Design, II.** Development of models for and analysis of pavement systems; use of transfer functions relating pavement response to pavement performance; evaluation and application of current pavement design practices and procedures; analysis of the effects of maintenance activities on pavement performance; and economic evaluation of highway and airport pavements. Prerequisite: Civil Engineering 320. 1 unit.
421. **Pavement Evaluation, Maintenance, and Rehabilitation.** Concepts and procedures for condition survey rating; evaluation by nondestructive testing (roughness, skid resistance, structural capacity); and destructive testing, maintenance strategies, and rehabilitation of pavement systems for highways and airfields. Prerequisite: Civil Engineering 320. 1 unit.
423. **Highway Materials Stabilization.** Stabilization of aggregates and soils with cement, lime, bituminous materials, and other stabilizing agents; emphasis on basic stabilization reactions, properties of stabilized materials, and composition design. Prerequisite: Civil Engineering 220 or consent of instructor. 1 unit.
424. **Transportation Soils Engineering.** Studies occurrence and properties of surficial soils, soil classification systems, soil variability; subgrade evaluation procedures, repeated loading behavior of soils; soil compaction and field control; soil moisture, soil temperature, and frost action; soil trafficability and subgrade stability for transportation facility engineering. Prerequisite: Civil Engineering 383 or equivalent. 1 unit.
427. **Geometric Highway Design.** Highway classification; highway capacity; highway design controls; sight distance; horizontal and vertical alignment; cross-section elements; highway types; controlled access highways; and design of at-grade intersections, grade separations, and interchanges. Prerequisite: Civil Engineering 325, or consent of instructor. 1 unit.
428. **Traffic Engineering Operations.** Theory of traffic control; laws and ordinances; design and application of traffic control devices; special street designations; parking design and control; street illumination; and miscellaneous traffic control designs. Prerequisite: Civil Engineering 325, or equivalent. 1 unit.
430. **Urban Transportation Modelling.** Urban transportation network and travel demand models; methods and data requirements for estimating model parameters; and implications for planning practice. Prerequisite: Civil Engineering 330 and Industrial Engineering 401. 1 unit.
431. **Transportation Systems Management.** Transportation Systems Management (TSM) consists of short-range, low cost schemes to improve urban transportation systems. The course examines what TSM tactics are available, problems of modelling their impacts, and evaluation of alternative TSM plans; it emphasizes the effects of traffic congestion in cities. Prerequisite: Civil Engineering 330 or equivalent. 1 unit.
439. **Environmental Systems Analysis, II.** Examines advanced topics in environmental systems analysis; emphasizes mathematical modeling of water quality systems and multi-objective programming methods of analysis. Other topics include large scale optimization models and inter-relationships between water quality and water quantity analyses, e.g., reservoir operation. Prerequisite: Civil Engineering 339. 1 unit.
440. **Processes for Water Quality Control, I.** Theory and basic design of processes used in water and wastewater treatment, including adsorption, ion exchange, chemical oxidation and reduction, disinfection, sedimentation, filtration, coagulation, flocculation, and chemical precipitation. Prerequisite: Credit or concurrent registration in Civil Engineering 340 and 343, or consent of instructor. 1 unit.
441. **Modeling of Water Quality in Natural Systems.** Studies mathematical modeling of the movement and fate of pollutants and other substances in streams, lakes, and other natural water bodies; focuses on the development of practical models of aquatic systems. Prerequisite: Civil Engineering 340 or 351. 1 unit.

- 442. Processes for Water Quality Control, II.** Theory and basic design of processes used in water and wastewater treatment, including gas transfer, slurry dewatering, incineration and residue disposal, and aerobic and anaerobic biological treatment processes. Prerequisite: Civil Engineering 340 and 343, and credit or concurrent registration in Civil Engineering 346, or consent of instructor. 1 unit.
- 443. Unit Operations in Environmental Engineering.** Experimental and pilot plant studies of unit operations and unit processes in environmental engineering, emphasizing water treatment and wastewater treatment; evaluation of parameters for the design of biological waste treatment units; determination of chemical requirements for water treatment processes; and studies of anaerobic digestion. Prerequisite: Civil Engineering 440 or credit or concurrent registration in Civil Engineering 442, or consent of instructor. 1 unit.
- 444. Treatment of Industrial Wastes.** Basic concepts in approaching and solving industrial waste problems; theory and application of unit operations unique to the treatment of industrial wastes; and advanced considerations of wastewater problems and solutions of major industries. Prerequisite: Credit or concurrent registration in Civil Engineering 442 or consent of instructor. 1/2 or 3/4 unit.
- 446. Design of Water Quality Control Plants.** A study of both fundamental and practical considerations in the design of treatment units and the combination of unit processes into an integrated plant. Prerequisite: Civil Engineering 440 and credit or registration in Civil Engineering 442, or equivalent. 1 unit.
- 448. Control of Air Pollution from Stationary Sources.** Same as Mechanical Engineering 411. Study of the basic theory of pollution control devices and their application to air pollution control problems. Prerequisite: Credit or concurrent registration in Civil Engineering 340 and 343, or consent of instructor. 1 unit.
- 450. Hydrologic Systems.** Application of systems concepts to simulate and analyze hydrologic cycle and its components in terms of various deterministic, probabilistic, stochastic, lumped, distributed, linear, and nonlinear mathematical models for the purpose of planning and designing water resources projects. Prerequisite: Civil Engineering 350 or consent of instructor. 1 unit.
- 452. Water Resources Systems.** The analytical design of modern water resources systems; emphasizes hydrosocioeconomic systems of single- and multiple-objective single-development water resources projects; and applies basic operations research techniques to the design of such systems in conjunction with consideration of intangible system parameters and constraints. Prerequisite: Civil Engineering 352 or equivalent and a course on operations research. 1 unit.
- 455. Transport Processes in Water.** Physical processes in transport by water, with emphasis on transport of pollutants; turbulent diffusion and longitudinal dispersion in pipes, rivers, and estuaries; stream reaeration; ocean outfalls; waste heat disposal; and dispersion in groundwater. Prerequisite: Mathematics 343 and 345, and Theoretical and Applied Mechanics 235, or consent of instructor. 3/4 or 1 unit.
- 458. Hydraulics of River Engineering.** Hydraulics of flow in rivers, including varied open-channel flow, unsteady flow, sediment transport, and stable-channel design. Prerequisite: Civil Engineering 351 or equivalent. 1 unit.
- 462. Design of Tall Building Structures.** Examines methods of analysis and design criteria for tall buildings: dead, live, wind, and earthquake loads; reinforced concrete and steel moment-resisting frames, shear walls, braced frames; plastic design of multistory steel braced frames; P-Delta effects and instability; unreinforced and reinforced masonry buildings; very tall buildings including framed tube, tube in tube, trussed tube and hat trusses. Prerequisite: Graduate standing in structural engineering with courses equivalent to Civil Engineering 363 and 466, or consent of instructor. 1 unit.
- 463. Optimization of Structures.** Structural design processes; formulation of problems in the optimization of structures; optimization of structural elements; minimum volume principles; and use of mathematical programming in optimization of structural systems. Prerequisite: Bachelor of Science degree in engineering with courses in structural analysis and design, or consent of instructor. 1 unit.

- 465. Behavior of Structural Steel Frameworks.** Theories of ultimate behavior of metal structural members with particular emphasis on buckling and stability of members and frames; interpretation of research findings and specifications for bridge and building design. Prerequisite: Civil Engineering 263. 1 unit.
- 466. Behavior of Reinforced Concrete Members.** In-depth study of the behavior of reinforced concrete members, including the relationships between behavior and building code requirements. Prerequisite: Civil Engineering 262 and 264. 1 unit.
- 467. Behavior of Reinforced Concrete Structures.** Study of the strength and behavior of assemblages of reinforced concrete members, including a study of the applicability of traditional elastic design procedures to structures which exhibit inelastic behavior under the influence of both short and long term loadings. Prerequisite: Civil Engineering 466. 1 unit.
- 469. Thin Shell Structures.** Fundamental membrane and bending theories of shells; application of theories to analysis and design of folded plates and cylindrical, rotational, and translational shells; membrane stresses and deflections; and approximate bending solutions by variational, finite-difference, and finite-element methods. Prerequisite: Civil Engineering 473 or consent of instructor. 1 unit.
- 473. Theory of Plates.** Classical plate bending theory; emphasis on methods of solution including series expansions, variational procedures, and finite element techniques applicable to plate-type structures commonly encountered in practice; consideration of inplane loads, large deflections, buckling, and anisotropy. Prerequisite: Civil Engineering 262 and Mathematics 345. 1 unit.
- 474. Dynamics of Framed Structures.** Advanced treatment of the dynamics of multidegree-of-freedom framed structural systems; fundamental concepts of eigenvalue theory of real matrices and energy principles of dynamics as bases for a unified approach to dynamical problems of structural assemblages; structural idealizations, principles of dynamics, Lagrange's equations, response calculations, normal mode method and its limitations; transfer matrix approach, and computer utilization. Prerequisite: Civil Engineering 361 and 374, or equivalent. 1 unit.
- 475. Behavior of Steel Structures.** Critical evaluation of the actual behavior of metals, connections, members, and structures; the significance of this behavior in terms of design and the development of design specifications. This course and Civil Engineering 465 form a unit in the study of theoretical and experimental investigations. Prerequisite: Graduate standing in civil engineering or theoretical and applied mechanics. 1 unit.
- 478. Finite Element Methods in Solid and Structural Mechanics.** Theory and application of the finite element method; stiffness matrices for triangular, quadrilateral, and isoparametric elements; two- and three-dimensional elements; algorithms necessary for the assembly and solution; direct stress and plate bending problems for static, nonlinear buckling and dynamic load conditions; displacement, hybrid, and mixed models together with their origin in variational methods. Prerequisite: Theoretical and Applied Mechanics 451, or Civil Engineering 379, or consent of instructor. 1 unit.
- 479. Earthquake Engineering.** Study of the effects of earthquakes on constructed works and of the design of structures to resist earthquake motions; earthquake ground motions and mechanisms; response of structures to earthquake motion; behavior of materials, elements, assemblages and structures subjected to earthquake motion; principles of earthquake resistant design; and special topics. Prerequisite: Civil Engineering 374. 1 unit.
- 480. Earth Pressures and Retaining Structures.** Classical and modern earth pressure theories and their experimental justification; pressures and bases for design of retaining walls, bracing of open cuts, anchored bulkheads, cofferdams, tunnels, and culverts. Prerequisite: Credit or concurrent registration in Civil Engineering 384. 1 unit.
- 481. Earth Dams and Related Problems.** Fundamentals of problems of slope stability; seepage in composite sections and anisotropic materials; methods of stability analysis; mechanism of failure of natural and artificial slopes; compaction; and field

observations. Prerequisite: Credit or concurrent registration in Civil Engineering 384. 1 unit.

- 482. Advanced Analysis of Consolidation of Clays.** Elastic solutions relevant to soil mechanics; permeability; general application of Terzaghi's theory of one-dimensional consolidation; advances in consolidation theories; mechanism of volume change; delayed and secondary compressibility and creep; theory of three-dimensional consolidation and solutions; radial flow and design of sand drains; and analysis and control of settlement. Prerequisite: Civil Engineering 383. 1 unit.
- 483. Advanced Analysis of Shear Strength of Soils.** Physico- chemical properties of soils; fabric and structure of soil; mechanism of shearing resistance; residual shear strength of overconsolidated clays and clay shales; long-term shear strength of overconsolidated clays; Hvorslev shear strength parameters; and undrained shear strength of clays. Prerequisite: Civil Engineering 383. 1 unit.
- 484. Foundation Engineering.** Critical study of case histories of projects in foundation engineering; current procedure for design and construction of foundations, embankments, and waterfront structures. Prerequisite: Civil Engineering 384. 1 unit.
- 486. Rock Mechanics, I.** Physical properties and classification of intact rock, theories of rock failure, state of stress in the earth's crust, stresses and deformations around underground openings assuming elastic, plastic, and time-dependent behavior; effect of geologic discontinuities on rock strength; and introduction to stability analyses in rock. Prerequisite: Civil Engineering 383; Geology 450 or equivalent; Theoretical and Applied Mechanics 321 or equivalent; or consent of instructor. 1 unit.
- 487. Rock Mechanics, II.** Application of rock mechanics to engineering problems; shear strength of rock masses; dynamic and static stability of rock slopes; deformability of rock masses; design of pressure tunnel linings and dam foundations; controlled blasting and blasting vibrations; tunnel support; machine tunneling; design and construction of large underground openings; and field instrumentation. Prerequisite: Civil Engineering 486 or consent of instructor. 1 unit.
- 488. Experimental Consolidation Research Methods.** Measurement of specific gravity of soil solids, Atterberg limits, and grain size; one-dimensional consolidation testing of natural soil samples; specimen preparation and sources of sample disturbance; loading procedures; sources of testing errors; and laboratory tests, analysis of data, and preparation of report. Prerequisite: Civil Engineering 383. 1/2 unit.
- 489. Experimental Shear Strength Research Methods.** Direct shear test; measurement of residual shear strength; drained and undrained triaxial compression tests; specimen preparation and sources of sample disturbance; loading procedures; pore pressure measurement; sources of testing errors; and laboratory tests, analysis of data, and preparation of report. Prerequisite: Civil Engineering 383. 1/2 unit.
- 494. Municipal Administration and Engineering.** Legal authority of municipalities, and forms of municipal government; municipal functions, organization, and management; city finance; engineering functions of city government; city planning and zoning; building codes and inspection; street lighting; public utilities; city cleaning; and recreational development. Prerequisite: Bachelor of Science in civil engineering or consent of instructor. 1 unit.
- 495. Civil and Environmental Engineering Seminar.** Discussion of current topics in civil and environmental engineering and related fields by staff, students, and visiting lecturers. 0 to 1/4 unit. Course may be repeated.
- 497. Independent Study in Civil Engineering.** Individual investigations or studies of any phase of civil engineering selected by the student and approved by the adviser and the staff member who will supervise the investigation. Prerequisite: Consent of instructor. 0 to 4 units.
- 498. Civil Engineering Special Topics.** Structured presentations of new and developing areas of knowledge in civil engineering at an advanced graduate level. Prerequisite: Individually identified for each offering under this course number; see Timetable. 1/4 to 1 unit.
- 499. Thesis Research.** 0 to 4 units

CLASSICAL CIVILIZATION

(See Classics)

CLASSICS

(Including Classical Civilization, Coptic, Greek, Latin, and Modern Greek)

Chairperson of Department: Professor J. K. Newman

Department Office: 4072 Foreign Languages Building, 707 South Mathews, Urbana

Classical Civilization

The following courses presuppose no knowledge of the Greek and Latin languages and are open to all students. For other courses in the area of classical civilization, see Architecture 210; History of Art 215, 216, and 323; History 181, 182, 381, 382, 383, and 384; Philosophy 203 and 310; Political Science 393; and Religious Studies 201, 202, 210, and 340.

100. **Vocabulary Building from Greek and Latin Roots.** Vocabulary building assistance for students through an analysis of Greek and Latin roots, prefixes, and suffixes found in English. 2 hours.
101. **PLATO Laboratory in English Vocabulary Building.** Intensive drill and practice in English words derived from key Latin and Greek roots. Prerequisite: Concurrent registration in Classical Civilization 100. 1 hour.
110. **Introduction to Greek Culture.** Study of social and cultural life in Greece during the classical period. 2 hours.
111. **Mythology of Greece and Rome.** A study of the major myths of Greece and Rome and their impact upon later art, music, and literature. 2 hours.
112. **The Roman Achievement.** Introduction to Roman civilization through the study of the social and cultural life of ancient Rome. 2 hours.
120. **Origins of Western Literature.** Same as Comparative Literature 120. The origins and development of selected major genres in Western literature, emphasizing the relationship between classical representatives and their modern successors. 3 hours.
131. **Introduction to Classical Archaeology: Greece.** Introduction to the archaeology of ancient Greece and the Aegean world. 3 hours.
132. **Introduction to Classical Archaeology: Rome and Italy.** Introduction to the archaeology of Italy and Rome to the fall of the Roman Empire. 3 hours.
140. **Women in Classical Literature.** Same as Comparative Literature 140. Examines how women are portrayed in the literature of classical antiquity; analyzes women's roles in ancient society and attitudes of ancient writers toward women. 3 hours.
150. **Sports in Greece and Rome.** Same as Physical Education 141. Athletics and sports in ancient Greece and Rome from 776 B.C. to 393 A.D. 2 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Greek Literature in Translation.** Same as Comparative Literature 206. Introduction to Greek literature, from Homer to the Hellenistic age, and its cultural and historical background. 3 hours.
202. **Latin Literature in Translation.** Same as Comparative Literature 207. Introduction to Latin literature of the classical period and to its cultural and historical background. 3 hours.
217. **Greek Art.** Same as History of Art 215. See History of Art 215.

- 218. Roman Art.** Same as History of Art 216. See History of Art 216.
- 221. The Heroic Tradition.** Same as Comparative Literature 263. Study of ancient epics and their relation to the social consciousness of their period; introductory and background lectures; and readings in the epic tradition of antiquity and its successors. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
- 222. The Tragic Spirit.** Same as Comparative Literature 264. Readings in the tragic drama of Greece and Rome: a systematic study of the contents and development of this classical literary/dramatic genre. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
- 230. The Comic Spirit.** Readings in the comic drama of Greece and Rome: a systematic study of the contents and development of this classical literary genre. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
- 231. The Development of the Ancient City.** Same as History of Art 217. Monuments and archaeological remains illustrating the development of the Greek and Roman city (polis). Prerequisite: Sophomore standing or consent of instructor. 3 hours.
- 232. Ancient Greek Sanctuaries.** Same as History of Art 218 and Religious Studies 232. A survey of the archaeological remains of ancient Greek sanctuaries and their importance to ancient society and religion. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
- 237. Ancient Greek Religion.** Same as Religious Studies 237. Religious developments in Greece from the prehistoric period to late antiquity. 3 hours.
- 292. Senior Thesis.** Thesis and honors; for candidates for departmental distinction in classical civilization and for other seniors. Prerequisite: Senior standing and consent of chairperson of classics honors program. 2 to 4 hours.
- 298. Senior Survey.** For candidates for departmental distinction in the classics field of concentration. Prerequisite: Senior standing. 2 to 4 hours.
- 315. Greek, Roman, and Medieval Rhetorical Theory.** Same as Speech Communication 315. See Speech Communication 315.
- 331. Ancient Satire.** Same as Comparative Literature 331. Reading and discussion of literary documents which question social values in the Greco-Roman world; focuses on Roman satire and ancient prose fiction. Prerequisite: Junior standing or consent of instructor. 3 hours or 3/4 unit.
- 332. The Ancient Ideal in Art and Literature.** Same as History of Art 317 and Comparative Literature 306. Study of the aesthetic standards and theories of the Graeco-Roman world and the ways in which these ideals are expressed in the literature, art, and architecture of antiquity. Prerequisite: Junior standing or consent of instructor. 3 hours or 3/4 unit.
- 343. The Archaeology of Greece.** Same as History of Art 315. Monuments, material remains, and sculpture and other arts illustrating the development of Greek civilization to 323 B.C. Prerequisite: A course in ancient history, art, or language, or consent of instructor. 3 hours or 3/4 unit.
- 344. The Archaeology of Italy.** Same as History of Art 316. Monuments, material remains, and sculpture and other arts illustrating the development of Graeco-Roman and other ancient Italian civilizations to 330 A.D. Prerequisite: A course in ancient history, art, or language, or consent of instructor. 3 hours or 3/4 unit.
- 382. Computer-Based Foreign Language Teaching.** Same as English as a Second Language, French, German, Humanities, Slavic, and Spanish 382, and Linguistics 386. See Humanities 382.
- 390. Topics in Classical Literature.** Same as Comparative Literature 307. Study of selected topics in Greek and Latin literature in translation; content is variable. Prerequisite: Classical Civilization 201 or 202, or consent of instructor. 3 hours, or 3/4 or 1 unit. May be repeated for credit.
- 391. Topics in Classical Archaeology and Civilization: Seminar and Tutorial.** Study of selected topics; variable content. Prerequisite: Consent of instructor. 1 to 4 hours, or 1/4 to 1 unit. May be repeated.

- 435. Archaeological Field Work.** Participation in archaeological excavation; discussion of methods and procedures and practice in actual working conditions. Prerequisite: Consent of instructor. 1 unit

Coptic

- 301. Introductory Coptic, I.** Same as Linguistics 314 and Religious Studies 301. Introduction to the principles of Coptic grammar and to the reading of biblical and gnostic texts. A knowledge of classical or koine Greek, though useful, is not required. 3 hours or 3/4 unit.
- 302. Introductory Coptic, II.** Same as Linguistics 315 and Religious Studies 302. Continuation of Coptic/Religious Studies 301 and Linguistics 314; reading of gnostic and postbiblical texts. Prerequisite: Coptic 301 or Linguistics 314. 3 hours or 3/4 unit

Greek

- 101. Elementary Greek.** Introduction to the fundamentals of classical Greek, including the reading of simple prose. 4 hours.
- 102. Elementary Greek.** Continuation of Greek 101. Grammar and reading. Prerequisite: Greek 101 or equivalent. 4 hours.
- 111. Elementary Koine Greek.** Same as Religious Studies 111. Introduction to the fundamentals of Koine Greek, including reading from the New Testament. 4 hours.
- 112. Elementary Koine Greek.** Same as Religious Studies 112. Continuation of Greek 111. Grammar and reading. Prerequisite: Greek 111 or equivalent. 4 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Intermediate Koine Greek.** Same as Religious Studies 200. Reading of narrative and epistolary New Testament Greek. Prerequisite: Greek 112 or equivalent. 4 hours.
- 201. Second-Year Greek.** Reading of Attic prose. Prerequisite: Greek 102 or equivalent. 4 hours.
- 202. Second-Year Greek.** Continuation of Greek 201. Introduction to epic Greek; reading of Homer. Prerequisite: Greek 201 or equivalent. 4 hours.
- 292. Senior Thesis.** Open to candidates for distinction in Greek. Prerequisite: Senior standing. 2 to 4 hours.
- 298. Senior Survey.** Thesis and honors. For candidates for honors in Greek and for other seniors. Prerequisite: Senior standing. 2 or 4 hours.
- 301. Third-Year Greek.** Readings in Attic prose. Prerequisite: Greek 202. 3 hours or 1/2 unit.
- 310. Introduction to Indo-European Linguistics.** Same as Latin 310 and Linguistics 309. See Linguistics 309.
- 311. Greek Prose Composition.** Practice in the writing of Greek prose. Prerequisite: Greek 201 or equivalent. 2 hours or 1/2 unit.
- 371. The Gospels.** Same as Religious Studies 371. Reading and analysis of the Greek Gospels following literary-critical, form- critical, and redaction-critical approaches. Prerequisite: Greek 200 or consent of instructor. 3 hours, or 3/4 or 1 unit.
- 391. Readings in Greek Literature.** Readings in authors or special topics chosen by the instructor from the entire extant literature in Greek. Prerequisite: Greek 301 or equivalent. 3 hours, or 3/4 or 1 unit. May be repeated for credit.
- 411. Advanced Composition.** Practice in writing continuous Greek prose, with special attention to stylistic problems. Prerequisite: Greek 311 or equivalent. 1/2 unit.
- 419. Proseminar (Poetry).** Concentrates on a major author from one of the following areas: epic, lyric, dramatic, or Hellenistic poetry. Areas normally follow this

sequence in successive years. Prerequisite: Greek 391 or equivalent. 1 unit. May be repeated as topic varies.

420. **Proseminar (Prose).** Concentrates on a major author from one of the following areas: history, philosophy, oratory, or Hellenistic prose. Areas normally follow this sequence in successive years. Prerequisite: Greek 391 or equivalent. 1 unit. May be repeated as topic varies.
431. **Special Disciplines.** Same as Latin 431. Variable content course concentrating on an area such as comparative grammar, epigraphy, metrics, palaeography, or papyrology. Prerequisite: Greek 391 and Latin 391, or equivalent. 1 unit. May be repeated as topic varies.
480. **Greek Seminar.** Research on special problems of Greek literature; required of all majors in classical philology. Prerequisite: A Greek proseminar. 1 unit.
493. **Independent Reading.** Prerequisite: Consent of the student's advisor and of the instructor. 1/4 to 2 units. May be repeated but no more than 1 unit of credit may be applied toward the minimum requirement for the M.A. degree, and no more than 2 units of credit may be applied toward the minimum requirement for the Ph.D. degree.
495. **Introduction to Classical Studies.** Same as Latin 495. An introductory survey for graduate students in classics; prepares students for work at the graduate level and surveys basic bibliography and methodology. Prerequisite: Graduate standing in classics. 1 unit.
499. **Thesis Research.** Guidance in writing theses for advanced degrees. 0 to 4 units

Latin

101. **Elementary Latin.** Grammar and reading for students who have had no work in Latin. 4 hours.
102. **Elementary Latin.** Grammar and reading of easy prose. Prerequisite: Latin 101 or one year of high school Latin. 4 hours.
103. **Intermediate Latin.** Review of grammar; reading of easy narrative prose. Prerequisite: Latin 102 or two years of high school Latin. 4 hours.
104. **Introduction to Latin Literature.** Continuation of Latin 103, with readings chiefly in Latin poetic literature. 4 hours.
105. **Intensive Elementary Latin.** Equivalent to Latin 101 and 102. Introduction to basic grammar and syntax for students who have had no previous Latin and want to learn at a rapid rate; use of computer-assisted individual mastery lessons. 8 hours.
106. **Intensive Intermediate Latin.** Equivalent to Latin 103 and 104. Review of grammar and syntax and reading of easy prose and poetry for students who have attained 102 proficiency and wish to advance more rapidly; use of computer-assisted program materials. Prerequisite: Latin 102 or 105, or a placement score showing high school achievement equivalent to Latin 102. 8 hours.
113. **Latin Composition.** Grammatical drill and practice in the simpler forms of expression. Required of those receiving the recommendation of the department as teachers. Prerequisite: Credit or concurrent registration in Latin 103 or three years of high school Latin. 2 hours.
114. **Latin Composition.** Continuation of Latin 113. Grammatical drill and practice in the simpler forms of expression. Required of those receiving the recommendation of the department as teachers. Prerequisite: Latin 113. 2 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Survey of Latin Literature.** The republican period. Prerequisite: Latin 104 or four years of high school Latin. 3 hours.
202. **Survey of Latin Literature.** The imperial period. Prerequisite: Latin 104 or four years of high school Latin. 3 hours.
270. **Parateaching.** Same as French, German, Russian, and Spanish 270. See French 270.

279. **Introduction to Foreign Language Education.** Same as French, German, Humanities, Russian, and Spanish 279. See Humanities 279.
280. **Teachers' Course.** Introduction to the problems of the teaching of Latin and a study of textbooks. Required of teacher- training majors in Latin. This course will not meet during the six-week student teaching period. Prerequisite: Latin 202; senior standing. 4 hours.
292. **Senior Thesis.** Thesis and honors. For candidates for honors in Latin and for other seniors. Prerequisite: Senior standing. 2 or 4 hours.
298. **Senior Survey.** Thesis and honors. For candidates for honors in Latin and for other seniors. 2 or 4 hours.
310. **Introduction to Indo-European Linguistics.** Same as Greek 310 and Linguistics 309. See Linguistics 309.
311. **Intermediate Prose Composition.** Practice in the writing of Latin prose. Prerequisite: Latin 114 or equivalent. 2 hours or 1/2 unit.
391. **Readings in Latin Literature.** Readings in authors or special topics chosen by the instructor from the entire extant literature in Latin. Prerequisite: Three years of college Latin or equivalent; consent of instructor. 3 hours, or 3/4 or 1 unit. May be repeated for credit.
400. **Beginning Latin for Graduate Students.** Basic grammar, syntax, and vocabulary; reading practice. Designed for graduate students who need to use Latin in their research. 4 hours. No graduate credit.
401. **Readings in Latin for Graduate Students.** Directed readings, largely in medieval and modern Latin. Designed for graduate students who need to use Latin in their research. Prerequisite: Latin 400 or two years of high school Latin, or equivalent. 4 hours. No graduate credit.
411. **Advanced Composition.** Practice in writing Latin prose, with special attention to stylistic questions. Prerequisite: Latin 311 or equivalent. 1/2 unit.
419. **Proseminar (Poetry).** Concentrates on a major author from one of the following areas: epic, lyric and elegiac, dramatic, or satirical poetry. Areas normally follow this sequence in successive years. Prerequisite: Latin 391 or equivalent. 1 unit. May be repeated as topic varies.
420. **Proseminar (Prose).** Concentrates on a major author from one of the following areas: history, philosophy, oratory, or epistolography. Areas normally follow this sequence in successive years. Prerequisite: Latin 391 or equivalent. 1 unit. May be repeated as topic varies.
431. **Special Disciplines.** Same as Greek 431. See Greek 431.
480. **Latin Seminar.** Research on special problems of Latin literature; required of all concentrators in classical philology. Prerequisite: A Latin proseminar. 1 unit.
493. **Independent Reading.** Prerequisite: Consent of the student's adviser and of the instructor. 1/4 to 2 units. May be repeated but no more than 1 unit of credit may be applied toward the minimum requirement for the M.A. degree, and no more than 2 units of credit may be applied toward the minimum requirement for the Ph.D. degree.
495. **Introduction to Classical Studies.** Same as Greek 495. See Greek 495.
499. **Thesis Research.** Guidance in writing theses for advanced degrees. 0 to 4 units

Modern Greek

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Elementary Modern Greek, I.** An introduction to Modern Greek, in its spoken and written forms, including the elements of formal grammar. All students in this course are required to register for one hour per week in the language laboratory. 5 hours.
202. **Elementary Modern Greek, II.** Second term of spoken Modern Greek; formal grammar based on graded lesson materials; and work in written Greek. All students

in this course are required to register for one hour per week in the language laboratory. Prerequisite: Modern Greek 201. 5 hours.

303. **Intermediate Modern Greek, I.** First term of second year of work in Modern Greek; drill for more advanced conversational fluency; introduction to a greater variety of styles and levels of discourse and usage; increasing study of the written language; and more formal grammar. All students in this course are required to register for one hour of work weekly in the language laboratory. Prerequisite: Modern Greek 202 or equivalent. 5 hours or 1 unit.
304. **Intermediate Modern Greek, II.** Continuation of Modern Greek 303. All students in this course are required to register for one hour of work weekly in the language laboratory. Prerequisite: Modern Greek 303 or equivalent. 5 hours or 1 unit

COMMUNICATIONS

Chairperson of Committee on Graduate Study: Professor H. S. Maclay
Office: 222b Armory, 505 East Armory, Champaign

101. **The Social and Cultural Foundations of the Mass Media.** Analysis of the evolution and structure of the mass media in the United States with special emphasis on the effects of the mass media on public life. Prerequisite: Freshman or Sophomore standing. 3 hours. Does not count toward major requirements in the College of Communications.
217. **History of Communications.** Same as Journalism 217. See Journalism 217.
218. **Communications and Public Opinion.** Same as Journalism 218. See Journalism 218.
220. **Processes and Systems of Communications.** Same as Journalism 220. See Journalism 220.
231. **Mass Communications in a Democratic Society.** Same as Journalism 231. See Journalism 231.
241. **Law and Communications.** Same as Journalism 241. See Journalism 241.
251. **Social Aspects of Mass Communications.** Same as Journalism 251 and Sociology 251. See Journalism 251.
291. **Special Problems.** Special projects, research, and independent reading in communications for students capable of individual work under the guidance of a faculty adviser. Prerequisite: Consent of the College. 1-3 hours.
307. **The Art of the Screen: Narration.** Same as Speech Communication 307. See Speech Communication 307.
308. **The Art of the Screen: Exposition and Persuasion.** Same as Speech Communication 308. See Speech Communication 308.
319. **Russian and East European Cinema.** Same as Slavic and Speech Communication 319. See Slavic 319.
323. **Language Acquisition.** Same as Linguistics 323 and Psychology 323. See Psychology 323.
325. **Introduction to Psycholinguistics.** Same as Linguistics 325. See Linguistics 325.
335. **Interpersonal Communication Processes.** Same as Speech Communication 335. See Speech Communication 335.
352. **Attitude Theory and Change.** Same as Psychology 352 and Sociology 352. See Psychology 352.
370. **Language, Culture, and Society.** Same as Anthropology 370 and Linguistics 370. See Anthropology 370.
377. **International Communications.** Same as Political Science 377. See Political Science 377.
414. **Seminar on Social Interaction.** Same as Sociology 414. See Sociology 414.
417. **Contemporary Viewpoints in Speech Communication Theory.** Same as Speech Communication 417. See Speech Communication 417.

- 420. **Seminar in Semantics.** Same as Philosophy 420. See Philosophy 420.
- 424. **Developmental Psycholinguistics.** Same as Linguistics 424 and Psychology 424. See Psychology 424.
- 425. **Psycholinguistics.** Same as Linguistics 425 and Psychology 425. See Psychology 425.
- 426. **Psycholinguistics.** Same as Linguistics 426 and Psychology 426. See Psychology 426.
- 432. **History of Libraries.** Same as Library and Information Science 432. See Library and Information Science 432.
- 437. **The Analysis of Interpersonal Interaction.** Same as Speech Communication 437. See Speech Communication 437.
- 444. **Seminar in Public Opinion.** Same as Sociology 444. See Sociology 444.
- 456. **Attitude Measurement and Behavioral Prediction.** Same as Psychology 456. See Psychology 456.
- 462. **Seminar in Radio and Television.** Same as Radio and Television 462. See Radio and Television 462.
- 463. **World Broadcasting.** Same as Radio and Television 463. See Radio and Television 463.
- 468. **The Political Economy of Communications.** Same as Journalism 468. See Journalism 468.
- 470. **Communications and Popular Culture.** Same as Journalism 470. See Journalism 470.
- 471. **Proseminar in Communications, I.** Same as Journalism 471. See Journalism 471.
- 472. **Proseminar in Communications, II.** Same as Journalism 472. See Journalism 472.
- 473. **History and Theory of Freedom of the Press.** Same as Journalism 473. See Journalism 473.
- 474. **Communications Systems.** Same as Journalism 474. See Journalism 474.
- 481. **Economic and Social Aspects of Advertising.** Same as Advertising 481. See Advertising 481.
- 482. **Research Methods in Advertising and Communications.** Same as Advertising 482. See Advertising 482.
- 485. **Advertising Planning and Decision Making.** Same as Advertising 485. See Advertising 485.
- 486. **Analytical Methods in Advertising and Communications.** Same as Advertising 486. See Advertising 486.
- 490. **Special Topics in Communications.** Prerequisite: Consent of chairperson of committee on graduate study in communications. 1/2 to 2 units.
- 492. **Research Methods in Communications.** Same as Journalism 492. Introduction to the methods of empirical research in the behavioral sciences applicable to research problems in human communication, with emphasis on studies of mass communication. Lectures, readings, and laboratory practice. Prerequisite: Consent of College of Communications. 1 unit.
- 499. **Thesis Research.** Prerequisite: Consent of chairperson of committee on graduate study in communications, and of thesis supervisor. 0 to 4 units. Students may reregister for a total of 8 units

COMPARATIVE LITERATURE

Director of Program: Professor H. Knust

Office: 2070 Foreign Languages Building, 707 South Mathews, Urbana

- 119. **The Literature of Fantasy.** Same as English 119. See English 119.
- 120. **Origins of Western Literature.** Same as Classical Civilization 120. See Classical Civilization 120.

130. **Italian Medieval Literature and Civilization.** Same as Italian 130. See Italian 130.
140. **Women in Classical Literature.** Same as Classical Civilization 140. See Classical Civilization 140.
141. **World Masterpieces in Western Culture, I.** Comparative study of selected works reflecting main currents of western literature and thought, such as biblical stories, Homer, Greek drama, Vergil, medieval romance and love lyrics, Dante, Boccaccio, Chaucer, Petrarch, Rabelais, Cervantes, and Shakespeare. 3 hours.
142. **World Masterpieces in Western Culture, II.** Comparative study of selected works reflecting main currents of western literature and thought, such as Moliere, Voltaire, Swift, Goethe, romantic lyrics, Melville, Flaubert, Dostoevsky, Ibsen, Joyce, Kafka, and Camus. 3 hours.
175. **Masterpieces of East Asian Literature.** Same as Asian Studies 175, Chinese 175, and Japanese 175. See Asian Studies 175.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Comparing World Literature, I.** An introduction to various methods in comparative literary study, including genres, thematics, literary relations, literary movements, and interdisciplinary approaches. Prerequisite: Comparative Literature 141 and 142; or one year of college literature; or consent of instructor. 3 hours.
202. **Comparing World Literature, II.** An analysis of several important world-views in western civilization (such as classical, Romantic, modern, and so forth), studied comparatively and in relation to selected figures in western literature. Prerequisite: Comparative Literature 141 and 142; or one year of college literature; or consent of instructor. 3 hours.
203. **Introduction to Persian Culture and Literature, I.** Same as Persian 205. See Persian 205.
204. **Introduction to Persian Culture and Literature, II.** Same as Persian 206. See Persian 206.
205. **Modern Literary Criticism.** Same as English 277. See English 277.
206. **Greek Literature in Translation.** Same as Classical Civilization 201. See Classical Civilization 201.
207. **Latin Literature in Translation.** Same as Classical Civilization 202. See Classical Civilization 202.
210. **Introduction to Modern African Literature.** Same as African Studies 210 and English 211. See African Studies 210.
211. **Japanese Literature in Translation, I.** Same as Asian Studies and Japanese 205. See Japanese 205.
212. **Japanese Literature in Translation, II.** Same as Asian Studies and Japanese 206. See Japanese 206.
213. **Chinese Literature in Translation, I.** Same as Asian Studies and Chinese 207. See Chinese 207.
214. **Chinese Literature in Translation, II.** Same as Asian Studies and Chinese 208. See Chinese 208.
215. **The Scandinavian Novel: Masterpieces in English Translation.** Same as Scandinavian 215. See Scandinavian 215.
217. **Women in Russian Literature.** Same as Russian 217. See Russian 217.
218. **Japanese Hero Types.** Same as Asian Studies and Japanese 218. See Japanese 218.
219. **Women in Japanese Literature.** Same as Asian Studies and Japanese 219. See Japanese 219.
224. **German Literature in Translation.** Same as German 200. See German 200.
228. **Special Topics in German Literature.** Same as German 296. See German 296.

233. **Introduction to French Literature in Translation, I.** Same as French 255. See French 255.
234. **Introduction to French Literature in Translation, II.** Same as French 256. See French 256.
243. **The World of Cervantes.** Same as Spanish 255. See Spanish 255.
244. **The Worlds of Jorge Luis Borges and Julio Cortazar.** Same as Spanish 250. See Spanish 250.
248. **Dostoevsky and Tolstoy.** Same as Russian 222. See Russian 222.
249. **Soviet Russian Literature.** Same as Russian 225. See Russian 225.
253. **Medieval Literature and Culture.** Same as English 202. See English 202.
255. **Renaissance Literature and Culture.** Same as English 204. See English 204.
257. **Literature and Culture of the Enlightenment.** Same as English 206. See English 206.
259. **Nineteenth-Century Literature and Culture.** Same as English 207. See English 207.
262. **Crime Fiction from Oedipus Rex to Rex Stout.** Study of the development and the various types of crime fiction in masterworks of world literature, popular literature, and film. 3 hours.
263. **The Heroic Tradition.** Same as Classical Civilization 221. See Classical Civilization 221.
264. **The Tragic Spirit.** Same as Classical Civilization 222. See Classical Civilization 222.
265. **Development of the Modern Drama.** Same as English 243. See English 243.
266. **Development of the Modern Drama.** Same as English 244. See English 244.
267. **The Short Story.** Same as English 245. See English 245.
268. **The Short Story.** Same as English 246. See English 246.
269. **Modern British and American Fiction in Relation to Continental Fiction.** Same as English 248. See English 248.
284. **Jewish Experience in Literature.** Same as English and Religious Studies 284. See English 284.
288. **French and Comparative Cinema, I.** Same as French 288. See French 288.
289. **French and Comparative Cinema, II.** Same as French 289. See French 289.
293. **Senior Thesis and Honors.** Independent research guided by tutor(s), leading to the writing of a comparative thesis. Intended primarily for candidates for honors in comparative literature, but open to other seniors. 3 to 6 hours. May be repeated to a maximum of 12 hours.
295. **Special Topics: Colloquium on Interdisciplinary Subjects.** Presentation and discussion of subjects relating literature to other disciplines; topics vary. 3 hours. May be repeated to a maximum of 6 hours.
304. **Literary Criticism from Plato to 1800.** Same as English 382. See English 382.
305. **Literary Criticism from 1800 to the Present.** Same as English 383. See English 383.
306. **The Ancient Ideal in Art and Literature.** Same as History of Art 317 and Classical Civilization 332. See Classical Civilization 332.
307. **Topics in Classical Literature.** Same as Classical Civilization 390. See Classical Civilization 390.
309. **Introduction to Sanskrit Literature in English Translation.** Same as Sanskrit 309. See Sanskrit 309.
310. **Modern African Fiction.** Same as African Studies and French 310 and English 370. See African Studies 310.
311. **The Chinese Novel.** Same as Asian Studies and Chinese 311. See Chinese 311.
312. **Modern Chinese Literature in Translation.** Same as Asian Studies and Chinese 312. See Chinese 312.
313. **The Divine Comedy.** Same as Italian 313. See Italian 313.
323. **Modern German Poetry.** Same as German 330. See German 330.
326. **Ibsen in Translation.** Same as Scandinavian 361. See Scandinavian 361.

327. **Strindberg and the Later Scandinavian Dramatists in Translation.** Same as Scandinavian 362. See Scandinavian 362.
331. **Ancient Satire.** Same as Classical Civilization 331. See Classical Civilization 331.
333. **Studies in French Literature in Translation.** Same as French 321. See French 321.
334. **Studies in Francophonie.** Same as French 379. See French 379.
335. **Polish Literature in Translation, I.** Same as Polish 345. See Polish 345.
336. **Polish Literature in Translation, II.** Same as Polish 346. See Polish 346.
337. **Nineteenth-Century Literature in Translation.** Same as Russian 315. See Russian 315.
338. **Twentieth-Century Literature in Translation.** Same as Russian 317. See Russian 317.
340. **Studies in Russian Literature and Society.** Same as Russian 360. See Russian 360.
351. **International Literary Movements.** Study of the development and mutation of literary movements and stylistic trends; emphasis changes from semester to semester. Prerequisite: One year of college literature or consent of instructor. 3 hours, or 3/4 or 1 unit.
353. **Petrarch and Boccaccio: Literature of the Italian Middle Ages.** Same as Italian 309. See Italian 309.
354. **Masterpieces of Italian Renaissance Literature.** Same as Italian 333. See Italian 333.
357. **Russian Modernism.** Same as Russian 324. See Russian 324.
359. **The International Folk Tale.** Same as English 367. See English 367.
361. **International Literary Genres and Forms.** Structure and development of literary genres and forms in historical perspective (for instance, drama, parody and the grotesque, poetry, fables and fabulists, and modern fiction); essential international components and significant national variations of such genres and forms. Emphasis changes from semester to semester. Prerequisite: One year of college literature or consent of instructor. 3 hours, or 3/4 or 1 unit.
362. **Topics in Modern Fiction.** Same as English 362. See English 362.
365. **Comedy.** Same as English 365. See English 365.
368. **Russian Drama.** Same as Russian 335. See Russian 335.
370. **Nabokov and the Emigre Literature.** Same as Russian 370. See Russian 370.
371. **International Literary Relations.** Study of specific relations between authors of different countries; influences of certain works, concepts, or tastes on another work, author, or country; and literary interaction between Eastern and Western cultures. Emphasis changes from semester to semester. Prerequisite: One year of college literature or consent of instructor. 3 hours, or 3/4 or 1 unit.
381. **International Literary Themes and Types.** Significance of recurring myths, themes, and great figures in world literature; analysis of basic structural patterns and types and of individual treatments in different literatures and genres; and study of several themes or figures each semester. Emphasis changes from semester to semester. Prerequisite: One year of college literature or consent of instructor. 3 hours, or 3/4 or 1 unit.
387. **Introduction to Myth and Folklore.** Same as English, German, Slavic and Speech Communication 387. See English 387.
391. **Literature and the Other Arts.** Study of the relationship between literature and other art forms; focuses on analogies of expression in different media, on specific influences among media, and on great artists who mastered several media. Emphasis changes from semester to semester. Prerequisite: One year of college literature or consent of instructor. 3 hours, or 3/4 or 1 unit.
396. **Special Topics in Comparative Literature.** Selected literary topics of international significance in relation to other cultural expressions. Prerequisite: Consent of instructor. 3 hours, or 3/4 to 1 unit. May be repeated to a maximum of 6 hours or 2 units.

401. **Theory of Literature.** Methods and objectives of the discipline of comparative literature. Prerequisite: Reading knowledge of two foreign languages; consent of instructor. 1 unit.
404. **Seminar in Renaissance and Baroque Literature.** Same as Spanish 418. See Spanish 418.
405. **See in Stylistics.** Same as Linguistics 405. See Linguistics 405.
415. **Dostoevsky.** Same as Russian 415. See Russian 415.
419. **Tolstoy.** Same as Russian 419. See Russian 419.
420. **Chekhov.** Same as Russian 420. See Russian 420.
425. **Studies in Contemporary Critical Problems.** Same as French 425. See French 425.
441. **Naturalism, Symbolism, and Expressionism.** Same as German 451. See German 451.
451. **Seminar in Literary Movements and Periods.** Investigation of the development and mutation of literary movements (classicism, romanticism, symbolism, etc.) through a study of critical texts and their reception in various countries. The subject of the seminar varies each semester. 1 unit. May be repeated to a total of 3 units.
452. **Seminar in Romantic Literature.** Same as English 433. See English 433.
461. **Seminar in Literary Genres and Forms.** Study of a form (the lyric, the novel, the drama, etc.) to discover its essential components in all the literatures studied and the significance of national variations. 1 unit. May be repeated to a maximum of 3 units as topic varies.
462. **Seminar in Spanish-American Novel.** Same as Spanish 436. See Spanish 436.
471. **Seminar in Literary Relations.** Investigation of the impact of one literature upon another, or of some specific works upon others (the role of English literature in continental Europe, the influence of Russian novelists on French and German writers, etc.). The subject of the seminar varies each semester. 1 unit. May be repeated to a maximum of 3 units.
472. **Studies in French and Comparative Cinema.** Same as French 452. See French 452.
478. **Seminar in Twentieth-Century French Literature.** Same as French 478. See French 478.
481. **Seminar in Literary Themes and Types.** Study of a theme or type (the Faust myth, the romantic hero, etc.) to discover its essential components in all the literatures studied and the significance of national variations. The subject of the seminar varies each semester. 1 unit. May be repeated to a maximum of 3 units.
482. **Seminar in Modern German Literature.** Same as German 461. See German 461.
484. **Narrative Semiotics.** Same as English, French, and Religious Studies 484. See French 484.
490. **Seminar in Contemporary Criticism, Methods and Theory.** Same as French 490. See French 490.
493. **Special Studies.** 1/4 to 1 unit.
499. **Thesis Research.** Intended for students engaged in writing a thesis as a partial requirement for the M.A. or Ph.D. degree in comparative literature. Maximum credit for master's candidates is 2 units. 0 to 4 units

COMPUTER SCIENCE

Head of Department: Professor J. N. Snyder

Department Office: 252 Digital Computer Laboratory, 1304 West Springfield, Urbana

NOTE: Credit is not allowed for more than one of Computer Science 101, 102, 103, 105, and 121. Credit is allowed for both Computer Science 106 and one of Computer Science 101, 102, 103, 105, or 121, except for students in the College of Engineering, College of Commerce and Business Administration, curriculum in architecture of the College of Fine and Applied Arts,

and physical science curricula and fields of concentration of the College of Liberal Arts and Sciences.

- 101. Introduction to Computers for Application to Engineering and Physical Science.** A beginning course in problem solving by digital computers which covers problem formulation, algorithm development, and coding in a high-level language; use of the computer in solving a series of problems. 3 hours.
- 102. Introduction to Computers and Their Application to Architecture.** Introduction to computer programming for students of architecture; higher-level programming languages and application programs of special use in architecture. 3 hours.
- 103. Introduction to Computers and Their Application to Social and Behavioral Science.** Introduction to computer programming for students with an interest in behavioral and social science computation; instruction in programming languages (FORTRAN and PL/I) with an emphasis on applications from statistical and data manipulative procedures. Prerequisite: Sophomore standing; one year of college mathematics or statistics. 3 hours.
- 105. Introduction to Computers and Their Application to Business and Commerce.** Introduction to computer fundamentals, higher language programming, and the use of the computer for the solution of business problems. 3 hours.
- 106. Introduction to Computers for the Nontechnical Major.** A concise treatment of the computer's important and still-growing role in virtually every significant aspect of society, including commerce, quantitative and qualitative planning, science, the criminal justice system, education, and medicine. The student is first taught to program computers interactively using an elementary programming language. Credit is allowed for both Computer Science 106 and one of Computer Science 101, 102, 103, 105, or 121, except for students in the College of Engineering, College of Commerce and Business Administration, curriculum in architecture of the College of Fine and Applied Arts, and physical science curricula and fields of concentration of the College of Liberal Arts and Sciences. 3 hours.
- 121. Introduction to Computer Science.** The first course for computer science majors and other students with a deep interest in the subject; introduces students to a high-level block-structured programming language and presents the fundamental techniques of using such a language for the solution of non-numerical problems. Students write several PL/1 programs during the course. Prerequisite: Three years of high school mathematics or Mathematics 111. 4 hours. Credit is not given for both Computer Science 121 and 122.
- 122. Introduction to Computer Science.** For students with previous programming experience as an alternative to Computer Science 121; presents the fundamental techniques of using a block-structured programming language for the solution of non-numerical problems. Students write several PL/1 programs. Prerequisite: Computer Science 101, 102, 103, or 105, or equivalent programming experience. 2 hours. Credit is not given for both Computer Science 121 and 122.
- 196. Honors Course in Computer Science.** This course is offered for honors credit in conjunction with other 100-level computer science courses, in which concurrent registration is required. Enrollment is strictly limited to beginning students with superior talents in computer science. A special examination may be required for admission to this course. Prerequisite: Concurrent registration in another 100-level computer science course (see Timetable); consent of instructor. 1 hour.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 221. Machine-Level Programming.** A basic course in machine-level programming. Organization of memory, central processor, and input/output devices; instruction and data types and their representation; structure and modularity of programs and data at the machine level; and introduction to system software. Prerequisite: Computer Science 121 or other 100-level computer science course, or consent of instructor. Computer Science 122 is recommended (but not required) in conjunction with Computer Science 101, 102, 103, or 105 when they are used as a prerequisite. 3 hours.

- 225. Data Structures.** A continuation of Computer Science 121; basic data types, including bits, integers, characters, and reals; data structures, including arrays, strings, lists, stacks, queues, and trees; storage management, including allocation and pointers; and searching and sorting techniques. Prerequisite: Computer Science 121 or 122. 3 hours.
- 257. Numerical Methods.** Same as Mathematics 257. An introduction to numerical methods for students in science and engineering; topics include floating-point computation, systems of linear equations, approximation of functions and integrals, the single nonlinear equation, and the numerical solution of ordinary differential equations; discusses various applications in science and engineering; includes some programming as well as the use of high quality mathematical library routines. Prerequisite: A basic computer science 100-level programming course, and Mathematics 240 or 241, or equivalent. 3 hours.
- 264. Introduction to the Structure and Logic of Digital Computers.** Introduction to the internal structure of digital computers; design of gates, flipflops, registers, and memories to perform operations on numerical and other data represented in binary form; and presentation in terms of logic devices (black boxes), not electrical circuits. Students may not receive credit for both Computer Science 264 and 360. Prerequisite: Computer Science 121 or equivalent is required; credit or concurrent registration in Computer Science 221 recommended. 3 hours.
- 265. Logic Design Laboratory with Integrated Circuits.** A digital design laboratory employing the department's EXCEL integrated circuit modular logic kits; emphasizes designing with logic blocks (not the design of their internal circuits), the theory of which is treated in Computer Science 264. Experiments with combinational and sequential networks and simple digital systems culminate in a term project. Prerequisite: Credit or registration in Computer Science 264 or credit in Electrical Engineering 290, or consent of instructor. 2 hours. Students may not receive credit for both Computer Science 265 and Electrical Engineering 249.
- 273. Introduction to Theory of Computation.** Introduction to the various aspects of the theory of computation, including the necessary background in graph theory, combinatorics, and probability theory; also includes algorithmic procedures, theoretical limitations of computing machines, analysis of algorithms, and correctness and efficiency of algorithms. Prerequisite: Computer Science 121 or equivalent, or consent of instructor. 3 hours.
- 281. Introduction to Computer Circuits.** Introduction to the operation and use of integrated and other circuits used in digital computers; for students with a basic knowledge of electricity and magnetism but lacking experience with electronic circuits. Prerequisite: Physics 107 or equivalent. 3 hours. Students may not receive credit for Computer Science 281 and Electrical Engineering 260 or 340.
- 290. Individual Study.** Prerequisite: Computer Science 121 or other Computer Science 100-level programming course, or consent of instructor. 1 to 3 hours.
- 296. Honors Course in Computer Science.** Group projects for honors work in computer science. Sections of this course are offered in conjunction with other 200-level computer science courses, in which concurrent registration is required. A special examination may be required for admission to this course. Prerequisite: Concurrent registration in another 200-level computer science course (see Timetable); consent of instructor. 1 hour.
- 297. Special Topics in Computer Science.** A lecture course in topics of current interest. See Timetable for current topics. Prerequisite: Consent of instructor. 2 to 4 hours.
- 300. Advanced Computer Programming.** Advanced features of programming languages; input/output disks and tapes; plotted output; and use of operating systems and job control languages. This course is intended primarily for students who are not majoring in computer science. Students majoring in computer science may not receive graduate credit for Computer Science 300. Students may not receive credit for both Computer Science 300 and 221. Prerequisite: Computer Science 100-level programming course or Computer Science 400, or consent of instructor. 3 hours or 1 unit.

311. **Information Systems.** Organization, use, and design of large data base systems; various logical views of data bases, uses of data bases, and physical implementations of data storage; and processing techniques, retrieval techniques, languages design questions, and system design questions. Students may not receive credit for both Computer Science 311 and 312. Prerequisite: Computer Science 225. 3 hours or 3/4 or 1 unit.
312. **Data Systems.** Organization of data into files; sorting, updating, and retrieving information; typical programming language facilities; storage devices; terminals; communication networks; and operating system facilities. Students may not receive credit for both Computer Science 312 and 311. Prerequisite: Accountancy 391 or 6 hours of computer science courses. 3 hours or 1 unit.
313. **Combinatorial Mathematics.** Same as Mathematics 313. See Mathematics 313.
316. **Interactive Systems for Instruction.** Systems for interactive instruction; survey of computer-aided instruction; and design and implementation of interactive programs. Prerequisite: A 100-level computer science course, Computer Science 400, or consent of instructor. 3 hours, or 3/4 or 1 unit.
317. **Computer-Assisted Instruction.** Same as Secondary Education 317. See Secondary Education 317.
318. **Computer Graphics.** Software, hardware, and mathematical tools for the representation, manipulation, and display of topological and two- and three-dimensional objects; applications of these tools to specific problems. Prerequisite: Computer Science 221, Computer Science 264, or Electrical Engineering 290, and consent of instructor. 3 hours, or 3/4 or 1 unit.
323. **Systems Programming.** Discussion of the organization and structure of operating systems for various modes of computer use from simple batch systems to time-sharing/multiprocessing systems. Prerequisite: Computer Science 221. 3 hours, or 3/4 or 1 unit.
325. **Programming Language Principles.** An introduction to the structure of programming languages. Formal specification of syntax and semantics; structure of algorithmic, list processing, string manipulation, data description, and simulation languages; basic data types, operations, statement types, and program structure; macro languages and their implementation; and run- time representation of programs and data. Prerequisite: Computer Science 221 or consent of instructor. 3 hours or 1 unit.
326. **Compiler Construction.** Compiler structure; lexical analysis, syntax analysis, grammars, description of programming languages, automatically constructed recognizers, and error recovery; and semantic analysis, semantic languages, semantic processes, intermediate language, optimization techniques, and extendible compilers. Prerequisite: Computer Science 325 or consent of instructor. 3 hours or 1 unit.
327. **Software Engineering.** Follows the software life cycle from the requirement, specification, and design phases through the construction of actual software. Topics include management of programming teams, programming methodologies, debugging aids, documentation, evaluation and measurement of software, verification and testing techniques, and the problems of maintenance, modification, and portability. Prerequisite: Computer Science 225. 3 hours, or 3/4 or 1 unit.
331. **Microprocessor Systems.** Study of microprocessor architectures, hardware modules, and interfaces; programming, software tools, development systems, and applications; and microprocessor system design methodology. Prerequisite: Computer Science 221; Computer Science 264 or Electrical Engineering 290. 3 hours, or 3/4 or 1 unit.
333. **Computer System Organization.** Computer system analysis and design; organizational dependence on computations to be performed; and speed and cost of parts and overall machines. Prerequisite: Computer Science 221; and Computer Science 264, Electrical Engineering 290, or Mathematics 391; or consent of instructor. 3 hours or 1 unit.
335. **Introduction to the VLSI System Design.** Same as Electrical Engineering 325. See Electrical Engineering 325.

- 337. Control Structure of Computers.** Same as Electrical Engineering 337. Asynchronous, synchronous, and microprogrammed control structures in the framework of computer architecture; interlocking of autonomous subcontrols; and case studies in typical control features: instruction look-ahead, multiprocessing interrupt, and input/output. Prerequisite: Computer Science, Electrical Engineering, or Mathematics 391 or Computer Science 221, or consent of instructor. 3 hours or 1 unit.
- 338. Communication Networks for Computers.** Same as Electrical Engineering 338. Introduction to data transmission, digital multiplexing, and data switching; characteristics of transmission media, terminals, modems, and communication processes; design of error control, line control, and information flow control procedures; study of message and packet switching networks; protocols and software in packet switching systems; and modeling techniques for networks. Prerequisite: Computer Science 264 or Electrical Engineering 290, and Mathematics 361 or Electrical Engineering 313, or equivalent. 3 hours or 1 unit.
- 339. Computer Aided Design for Digital Systems.** Same as Electrical Engineering 339. Examines fundamental concepts, techniques, and tools for the computer-aided design of digital systems; topics include hardware description languages, hardware compilers, evaluation and simulation of computer architectures, logic and circuit simulation, testing, partitioning, placement and routing algorithms and the integration of CAD tools into a complete design automation systems. Prerequisite: Computer Science 264 or Electrical Engineering 290; Computer Science 221 or Electrical Engineering 291; and Computer Science 281 or Electrical Engineering 340 and 342. 3 hours, or 3/4 or 1 unit.
- 341. Mechanized Mathematical Inference.** Introduces methods of mathematical inference which can be programmed on a computer; topics include propositional calculus decision procedures, forward and backward chaining, semantics, resolution, equational systems, specialized decision procedures, applications to program verification, abstraction, and problem representation. Prerequisite: Computer Science 273 or Mathematics 314, or equivalent, and a 100-level programming course, or consent of instructor. 3 hours or 3/4 or 1 unit.
- 342. Computer Inference and Knowledge Acquisition.** Systematically describes principles and algorithms underlying development of artificial intelligence systems, with special emphasis on methods of computer inference and knowledge acquisition; topics include deductive and inductive inference systems, plausible reasoning techniques, problem solving strategies, knowledge representation schemes, machine learning, conceptual data analysis, prediction and discovery programs, automatic programming, and planning strategies. Prerequisite: Computer Science 221 and a course in formal logic, or consent of instructor. 3 hours, or 3/4 or 1 unit.
- 346. Pattern Recognition and Machine Learning.** Organized review of basic theoretical concepts and methods of machine learning and recognition; decision space and linguistic and relational representation of objects; statistical and deterministic recognition algorithms; various types of learning, including adaptive, procedural, and inductive; selected applications; and medical consulting, determination of cost-optimal classification rules, inferential information systems, and computer vision. Prerequisite: Computer Science 264, or equivalent, and Computer Science 225; or consent of instructor. 3 hours, or 3/4 or 1 unit.
- 347. Knowledge-Based Programming.** Examines use of the computer to process human-made knowledge-bases. Topics include: trade-off of search versus knowledge; complexity of finite problem- domains; machine-aided acquisition of knowledge from experts; acquisition of knowledge by computer induction; validation and measurement methods, production-rule programming; and logic programming. Prerequisite: Computer Science 273, and a 100-level programming course. 3 hours, or 3/4 or 1 unit.
- 348. Introduction to Artificial Intelligence.** Same as Electrical Engineering 348. See Electrical Engineering 348.

- 355. Numerical Methods for Partial Differential Equations.** Same as Mathematics 355. An introduction to numerical techniques for initial and boundary value problems in partial differential equations; includes finite difference and finite element discretization techniques, direct and iterative solution methods for discrete problems, and programming techniques and usage of FORTRAN packages. Prerequisite: Computer Science 257, a course in linear algebra and a course in differential equations or advanced calculus, or consent of instructor. 3 hours, or 3/4 or 1 unit.
- 358. Numerical Analysis: Linear Problems.** Same as Mathematics 358. Numerical methods for linear algebra and eigenvalue problems with some applications to linear boundary value problems for differential equations. Prerequisite: Computer Science 257, Mathematics 315 or 318, and Mathematics 343; or consent of instructor. 3 hours or 1 unit.
- 359. Numerical Analysis: Nonlinear Problems.** Same as Mathematics 359. The development and analysis of algorithms for polynomial and spline interpolation; least squares and Chebyshev approximation; interpolatory and Gaussian quadrature; solution of systems of nonlinear equations; and the initial-value problem in ordinary differential equations. Prerequisite: Computer Science 257 and Mathematics 343, or consent of instructor. 3 hours or 1 unit.
- 360. Scientific Applications of Minicomputers.** Structure and programming of a minicomputer; operation and use of minicomputer peripherals; and basic digital design techniques using commercially available integrated circuits, with emphasis on the use of minicomputers in scientific experiments. Students in the M.S. or Ph.D. program in computer science may not receive graduate credit for Computer Science 360. Students may not receive credit for both Computer Science 360 and 264. Prerequisite: Any introductory computer science course, or consent of instructor. 4 hours or 1 unit.
- 363. Integrated Circuit Logic Design.** IC fabrication techniques; survey of different IC logic families; logic design procedures for each IC logic family; design of masks; logic design of digital networks with IC packages; use of ROMs as substitute for gates; computer-aided design; and comparison of different implementation approaches based on different IC logic families, from the viewpoints of economy, performance, and design time. Prerequisite: Computer Science 281 or equivalent and Mathematics 391, or consent of instructor. 3 hours or 1 unit.
- 364. Introduction to Computer Arithmetic.** Same as Electrical Engineering 364. Review of binary number representations, logical design of adders and arithmetic units, and simple multiplication and division methods; multiplier recoding; redundant division methods; design of carry-save adders and signed-digit arithmetic units; and case studies of high-speed arithmetic units. Prerequisite: Computer Science 264 or Electrical Engineering 290. 3 hours or 1 unit.
- 373. Combinatorial Algorithms.** Same as Mathematics 373. Representation and generation of combinatorial objects; searching: exhaustive search and its approximations and fast search techniques; sorting and related problems; graph algorithms; NP-hard and NP-complete combinatorial problems. Prerequisite: Computer Science 273 or 225, Mathematics 319, or consent of instructor. 3 hours or 3/4 or 1 unit.
- 375. Automata, Formal Languages, and Computational Complexity.** Same as Mathematics 375. Finite automata and regular languages; pushdown automata and context-free languages; Turing machines and recursively enumerable sets; linear-bounded automata and context-sensitive languages; computability and the halting problem; undecidable problems; recursive functions; and computational complexity. Prerequisite: Mathematics 319 or consent of instructor. 3 hours or 1 unit.
- 378. Computer Application to Problems in Mathematics.** Same as Mathematics 378. Discussion of many problems which can be formulated mathematically and lend themselves to computer solution. Problems are chosen from the following major areas: applied statistics, in particular Monte Carlo techniques and simulation;

- combinatorics; symbolic algebra; and game playing and decision problems. Prerequisite: Junior standing; Computer Science 121 or other Computer Science 100-level programming course, or consent of instructor. 3 hours or 1 unit.
381. **Introduction to Computer Memories and I/O.** Same as Electrical Engineering 381. Introduction to memories, input/output devices, and optical processors; lecture and demonstration. Prerequisite: Computer Science 281, Electrical Engineering 340, or equivalent. 3 hours, or 3/4 or 1 unit.
383. **Linear Programming.** Same as Mathematics 383. See Mathematics 383.
384. **Computer Data Acquisition Systems.** Theory, operation, and design of computer data acquisition systems; analog and digital aspects, conversions between representations, interfacing and systems considerations. Prerequisite: Computer Science 264 and 281. 3 hours, or 3/4 or 1 unit.
385. **Digital Computer Semiconductor Device Technology.** Presents the theory, technology and fabrication of integrated circuits for computers; compares attributes of the latest technologies; and discusses important device parameters, and develops models suitable for computer use. Students may not receive credit for this course and Electrical Engineering 340. Prerequisite: Computer Science 281 or equivalent. 3 hours, or 3/4 or 1 unit.
386. **Information Display Systems.** Same as Electrical Engineering 396. Explores theory and operation of computer display devices and systems; studies design considerations and available technologies; and examines human and machine aspects. Prerequisite: Computer Science 281 or Electrical Engineering 340. 3 hours, or 3/4 or 1 unit.
389. **Advanced Computer Circuits.** Theory, operation and use of digital integrated circuit technologies that are commonly used in modern digital computers; provides an understanding of the operation of various computer technologies, design knowledge at the integrated circuit package level, and an introduction to computer circuit design aids. Students may not receive credit for both Electrical Engineering 380 and this course. Prerequisite: Computer Science 264 and 281. 3 hours, or 3/4 or 1 unit.
391. **Switching Theory.** Same as Electrical Engineering 391 and Mathematics 391. See Mathematics 391.
392. **Finite State Machines.** Same as Mathematics 392 and Electrical Engineering 392. See Mathematics 392.
397. **Special Topics in Computer Science.** Lectures in topics of current interest. See Timetable for current topics. Prerequisite: Consent of instructor. 1 to 4 hours, or 1/4 to 1 unit.
400. **Introduction to Automatic Digital Computing for Graduate Students.** Beginning course covering the programming of digital computers using procedure-oriented language. No graduate credit allowed. 1 hour.
405. **Numerical Methods in Fluid Dynamics.** Same as Atmospheric Science 405. See Atmospheric Science 405.
414. **Engineering Applications of Linear Graphs.** Same as Electrical Engineering 414. See Electrical Engineering 414.
425. **Topics in Compiler Construction.** Advanced topics in compiler construction, including incremental and interactive compiling, error correction, code optimization, models of code generators, etc. Prerequisite: Computer Science 225 and 326, or consent of instructor. 1 unit.
433. **Theory of High-Speed Parallel Computation.** Same as Electrical Engineering 433. Theoretical aspects of parallel and pipeline computation; time and processor bounds on classes of computations; data alignment network speed and cost bounds; conflict-free access memories; and overall computer system ideas. Prerequisite: Computer Science 333 or equivalent. 1 unit.
441. **Computer Systems Analysis.** Same as Electrical Engineering 441. Development of analytical models of computer systems and application of such models to performance evaluation; topics include scheduling policies, paging algorithms, multiprogrammed resource management, and queueing theory. Prerequisite: Mathematics 361 or 363, Electrical Engineering 313, or equivalent. 1 unit.

- 443. **Linear and Integer Programming.** Discussion of mathematical programming algorithms which are widely used along with their software packages and computational efficiencies; a self-contained discussion of linear programming; and discussion of the various algorithms of integer programming. Prerequisite: Mathematics 315 or equivalent. 1 unit.
- 445. **Systems Modeling and Simulation.** Same as Business Administration 475. See Business Administration 475.
- 456. **Coding Theory.** Same as Electrical Engineering 456 and Mathematics 476. See Electrical Engineering 456.
- 457. **Numerical Solution of Ordinary Differential Equations.** Same as Mathematics 457. Derivation and rigorous analysis of one-step, multistep, and extrapolation methods, variable stepsize, error estimation, stiff equations, and boundary value problems. Prerequisite: Computer Science 359 and Mathematics 315 or 318, or consent of instructor. 1 unit.
- 458. **Topics in Numerical Analysis.** Same as Mathematics 458. Prerequisite: Consent of instructor. 1 unit. May be repeated.
- 463. **Information Theory.** Same as Electrical Engineering 463 and Mathematics 463. See Mathematics 463.
- 464. **Topics in Digital Computer Arithmetic.** Same as Electrical Engineering 464. Topics selected from the advanced theory of digital computer arithmetic, including division methods, use of redundancy, and implications of the use of number representations, such as continued products and continued fractions. Prerequisite: Computer Science 364. 1 unit.
- 465. **Topics in Automata Theory.** Same as Electrical Engineering 465 and Mathematics 465. See Mathematics 465.
- 469. **Introduction to Coherent Optics and Holography.** Same as Electrical Engineering 469. See Electrical Engineering 469.
- 473. **Topics in Analysis of Algorithms.** Theoretical analysis of various algorithms; topics include sorting, searching, selection, polynomial evaluation, matrix multiplication, and multiplication of real numbers. Prerequisite: Computer Science or Mathematics 373 or equivalent, or consent of instructor. 3 hours or 1 unit.
- 474. **Topics in Graph and Geometric Algorithms.** Same as Electrical Engineering 474. See Electrical Engineering 474.
- 475. **Topics in Combinatorics.** Same as Mathematics 475. Selected topics from graph theory, algebraic coding theory, enumerative analysis, combinatorial design, and discrete optimization; includes other topics of current research interest, such as Ramsey's Theorem, Sperner's Theorem, Dilworth's Theorem, and the theory of matroids. Prerequisite: Computer Science 273, Mathematics 313, or consent of instructor. 1 unit.
- 485. **Topics in Computer Hardware.** Same as Electrical Engineering 485. Advanced features of computer hardware; topics vary, but typically are chosen from: memories, optical data processing and storage, device modeling and computer-aided circuit design, and stochastic representation and processing of information. Prerequisite: Consent of instructor. 1 unit.
- 487. **Theory of Approximation.** Same as Mathematics 487. See Mathematics 487.
- 490. **Individual Study.** Individual study or reading in a subject not covered in normal course offerings. Prerequisite: Consent of instructor. 1/2 to 4 units.
- 491. **Seminar in Computer Science.** Seminar on topics of current interest. See Timetable for current topics. Prerequisite: Consent of instructor. 0 to 1 unit.
- 497. **Special Topics in Computer Science.** Lecture course in topics of current interest. See Timetable for current topics. Prerequisite: Consent of instructor. 1/2 to 1 unit.
- 499. **Thesis Research.** Section A, for master's degree candidates; Section B, for doctoral degree candidates. Prerequisite: Consent of instructor. 0 to 4 units

COPTIC

(See Classics)

CZECH

(See Slavic Languages and Literatures)

Crafts

(See Art and Design)

DAIRY SCIENCE

Head of Department: Professor W. R. Gomes

Department Office: 315 Animal Sciences Laboratory, 1207 West Gregory Drive, Urbana

100. **Introduction to Dairy Production.** Survey of industry; breeds of cattle; and selection, feeding, and management of herds. Lecture, quiz, and laboratory. 3 hours.
110. **Plant and Animal Genetics.** Same as Agronomy, Animal Science, and Horticulture 110. See Agronomy 110.
203. **Behavior of Domestic Animals.** Same as Animal Science and Ecology, Ethology, and Evolution 203. See Animal Science 203.
204. **Dairy Cattle Evaluation.** Evaluation of physical traits of dairy cattle in relation to economic value and genetic improvement; sire selection, mating systems, and breed families in relation to the organization of genetic improvement programs for dairy cattle; and lecture and laboratory. Prerequisite: Dairy Science 100 or consent of instructor. 3 hours.
206. **Dairy Management Field Studies.** Field studies during spring break of dairy farms and dairy service industries; discussions and demonstrations of management practices of commercial dairy farms; and written report required. See Timetable for approximate cost. 1 hour. May be repeated to a maximum of 4 hours.
221. **Animal Nutrition.** Same as Animal Science 221. See Animal Science 221.
230. **Comparative Physiology of Reproduction, Lactation, and Growth.** Same as Animal Science 230. See Animal Science 230.
250. **Dairy Science Internship.** A supervised off-campus learning experience in a dairy-related enterprise. Prerequisite: Junior standing in dairy science or agricultural science with dairy science emphasis, good academic standing; Dairy Science 100 and a 200-level course in dairy science. 2 to 4 hours.
300. **Special Problems.** Supervised research on any phase of dairy science, including biochemistry, genetics, management, microbiology, nutrition, and physiology. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in dairy science subject to approval of the instructor. Prerequisite: Not open to students on probation; written consent of instructor and authorized departmental approval are required prior to advance enrollment and registration. 1 to 5 hours, or 1/2 to 1 unit.
301. **Dairy Herd Management.** The technology of modern milk production practices; application of principles in nutrition, physiology, economics, health and hygiene, waste management, and facilities design for efficient dairy herd management systems. See Timetable for approximate cost of field trip. Appropriate for students in veterinary medicine interested in large animal practice. Prerequisite: Animal Science 221 or equivalent. 3 hours or 3/4 unit.

- 305. Genetics and Animal Improvement.** Same as Animal Science 305. Principles of heredity and their application to the problems of animal improvement. Prerequisite: Agronomy 110 or equivalent. 3 hours or 3/4 unit (summer session, 1/2 unit).
- 308. Physiology of Lactation.** The anatomy and endocrinology of mammary development; the environmental, endocrinological, and biochemical factors which affect the yield and composition of milk. Prerequisite: Chemistry 102 or 103, or equivalent with consent of instructor. 4 hours or 1 unit.
- 316. Population Genetics.** Same as Genetics and Development 316. Mathematical theory of the genetics of populations: estimation of gene frequency, Hardy-Weinberg principle, systems of mating, relationship between relatives, and forces that change gene frequency; applications to man, animals, and plants. Students desiring 4 hours or 1 unit credit do additional work in some area of population genetics. Prerequisite: Agronomy 110, or Genetics and Development 210 and college algebra, or consent of instructor. 3 or 4 hours, or 3/4 or 1 unit.
- 317. Quantitative Genetics.** Same as Genetics and Development 317. The mathematical theory of the genetics of quantitative traits: properties of random-mating populations; estimation of repeatability, heritability, and genetic correlation; genetic results of selection; selection methods; correlated response; and selection for more than one trait. Application to animals and plants. Students desiring 4 hours or 1 unit credit will do additional work in some area of quantitative genetics. Prerequisite: Dairy Science 316, and Agronomy 340 or Biology 371; or consent of instructor. 3 or 4 hours, or 3/4 or 1 unit.
- 320. Nutrition and Digestive Physiology of Ruminants.** Same as Animal Science 320. Physiology and microbiology of digestion in the ruminant, and biochemical pathways of utilization of the absorbed nutrients for productive purposes. Prerequisite: Animal Science 221. 3 hours or 3/4 unit (four-week summer session, 1/2 unit).
- 330. Reproduction and Artificial Insemination of Farm Animals.** Same as Animal Science 330. The anatomy and physiology of reproduction in farm animals, the principles of artificial insemination, and the factors affecting conception in natural and artificial breeding. Prerequisite: Dairy Science 100 or Animal Science 100. 3 hours or 3/4 unit (four-week summer session, 2 hours or 1/2 unit).
- 340. Introduction to Applied Statistics.** Same as Agricultural Engineering, Agronomy, Animal Science, Food Science, Forestry, and Horticulture 340. See Agronomy 340.
- 345. Statistical Methods.** Same as Animal Science and Forestry 345. Studies the design and analysis of experiments: multiple regression, method of fitting constants, factorial experiments with unequal subclass numbers, analysis of covariance, experimental designs; examines computer applications to agricultural experiments using statistical packages. Prerequisite: Agronomy 340, or Mathematics 263, or equivalent. 4 hours or 1 unit. Credit is not given for both Dairy Science 345 and Agronomy 440.
- 350. World Animal Agriculture.** Same as Animal Science 350. See Animal Science 350.
- 385. Gastrointestinal and Methanogenic Microbial Fermentations.** Fundamental aspects of the ecology of microorganisms and their biochemical activities related to the anaerobic degradation of organic matter; emphasizes anaerobic ecosystems of the mammalian gastrointestinal tract and methanogenic organic residue fermentations (animal wastes, sediments). Prerequisite: Biochemistry 350 or Biochemistry 352 and 353, and Microbiology 100; or Microbiology 200 or 309, or consent of instructor. 3 hours or 3/4 unit.
- 402. The Microbiology and Physiology of Ruminant Nutrition.** Physiological and microbiological aspects of ruminant digestion and their influence on the metabolism of the extraruminal tissues; interpretation of nutritive requirements in terms of rumen microbial activities; and evaluation of research techniques. Prerequisite: Biochemistry 350 or equivalent. 3/4 unit.
- 408. Physiology and Biochemistry of Milk Secretion.** Biological structure and function of lactating mammary tissue, ruminant and nonruminant; emphasizes mammary secretory cell biochemical pathways, ultrastructure, and transport mechanisms

- pertaining to milk synthesis. Prerequisite: Dairy Science 308 and Biochemistry 350, or equivalent; or consent of instructor. 3/4 unit.
410. **Current Topics in Nutritional Research.** Same as Food Science and Nutritional Sciences 410. See Nutritional Sciences 410.
 411. **Chemistry of Nutritional Processes.** Same as Food Science and Nutritional Sciences 411. See Nutritional Sciences 411.
 412. **Advanced Endocrinology.** Same as Animal Science, Physiology, and Veterinary Biosciences 412. See Physiology 412.
 415. **Linear and Non-Linear Statistical Models for Biologists.** Same as Animal Science and Forestry 415. See Animal Science 415.
 416. **Statistical Genetics and Breeding Plans.** Same as Animal Science 416. See Animal Science 416.
 417. **Advanced Quantitative Genetics.** Same as Genetics and Development 417. Advanced theory of the genetics of quantitative traits; lectures, student presentations, and discussions on selected readings; and application to biological systems. Offered in alternate years. Prerequisite: Dairy Science 317 and Agronomy 440; or Agronomy 444; or consent of instructor. 1 unit.
 430. **Gametogenesis and Early Embryo Development.** Examines physiology of spermatogenesis and oogenesis in mammals; studies factors influencing gamete maturation, transport, fertilization, and early embryonic development. Prerequisite: Animal Science 230, or Dairy Science 330; or Animal Science 406 and Biochemistry 350. 1 hour.
 441. **Advanced Design and Analysis of Biological Experiments.** Same as Agronomy 441. See Agronomy 441.
 481. **Animal Biochemical Laboratory Techniques.** Same as Animal Science 481. Theory and application of biochemical laboratory techniques to research in the animal-oriented biological sciences; isolation, characterization, and analysis of biological compounds including enzymes, metabolic intermediates, and cellular components; and determination of metabolic pathways and processes. Prerequisite: Biochemistry 355 and consent of instructor. 1 unit.
 490. **Dairy Science Seminar.** Discussions of current research and literature. Registration for 0 or 1/2 unit every semester is required for graduate students majoring in dairy science. 0 or 1/2 unit.
 493. **Special Problems.** Individual investigation in any phase of dairy science. 1/2 to 2 units.
 499. **Thesis Research.** 0 to 4 units

DANCE

Head of Department: Professor P. K. Knowles

Department Office: 4-305 Krannert Center for the Performing Arts, 602 South Goodwin, Urbana

101. **Beginning Modern Dance.** Introduction to basic dance technique and movement improvisation; the study of motion as an art, group relationships in improvisation, and discussion of choreographic ideas. For nondance majors. 1 hour. May be repeated for a maximum of 4 hours.
102. **Intermediate Modern Dance.** Intermediate dance technique and improvisation. For nondance majors. Prerequisite: Dance 101 or consent of instructor. 1 hour. May be repeated for a maximum of 4 hours.
105. **Jazz.** Introduces basic dance technique and stylistic work in the jazz idiom. For non-dance majors. 1 hour. May be repeated to a maximum of 4 hours.
107. **Ballet Fundamentals, I.** Introduction to ballet for nondance majors. 1 hour. May be repeated to a maximum of 4 hours.

108. **Ballet Fundamentals, II.** A progressive development of the concepts and skills in Dance 107; for the nondance major. Prerequisite: Dance 107; or equivalent and consent of instructor. 1 hour. May be repeated to a maximum of 4 hours.
118. **Introduction to Dance Production.** Surveys production terminology; techniques, skills, and methodology required to mount a dance concert; areas of instruction include lighting, costuming, scenery, and audio. 2 hours.
130. **Performance Practicum, I.** Performance laboratory involving the rehearsal and performance of student works under faculty supervision and/or of works by faculty and visiting artists. Prerequisite: Consent of instructor. 1 to 3 hours (1 or 2 hours credit per dance). A maximum of 16 hours of performance credit (Dance 130, 330, 335) may be counted toward degree requirements.
131. **Production Practicum.** Practical experience in the production of dance concerts mounted in the Krannert Center for the Performing Arts and on tour with the Illinois Dance Theatre. 1 or 2 hours (1 or 2 hours (1 hour credit per concert up to 2 hours per semester)). May be repeated to a maximum of 6 hours.
147. **Movement Fundamentals.** Approaches to increasing ease and efficiency of movement; emphasizes general body awareness, connectedness, relaxation, strength, and mobility in pedestrian and dance movement; individual assessment and prescribed correctives. 1 hour. May be repeated to a maximum of 2 hours.
150. **Orientation to Dance as Art and Education.** Orientation to the field of dance and its place in education; general dance history, history of modern dance movement, philosophy of dance, and discussion of theories and problems involved in dance education. 2 hours.
160. **Modern Technique, I.** Elementary technique for majors with emphasis on a conceptual understanding of movement principles and the development of technical skill and performance sensitivity. Prerequisite: Departmental audition. 1 to 3 hours. May be repeated to a maximum of 18 hours.
162. **Improvisation, I.** Experience in selective basic processes of movement involvement, both individual and group; special attention to organic economical bodily use, the dynamics and quality of which are necessary to the activity being performed. 1 hour.
163. **Improvisation, II.** Continuation of Dance 162, with emphasis on expanding bodily activity into various existing or created performing environments; use of sound and music, body coverings, and properties; and special attention to relating these experiences to dance composition. Prerequisite: Major standing or consent of instructor. 1 hour.
164. **Beginning Composition.** Theory and practice in principles of dance composition; emphasis on solo creative work using various approaches to composition. Prerequisite: Dance 163 or consent of instructor. 2 hours.
166. **Ballet, I.** Elementary ballet for dance majors; emphasizes placement, refinement of adagio, pirouette, jumps, and connecting steps. 1 or 2 hours. May be repeated to a maximum of 8 hours.
168. **Music Theory for Dancers.** An introduction to basic music theory: rhythms (including experience playing existing and created percussion scores), major and minor scales, chords, intervals, phrases, cadences, and rhythmic and harmonic analysis of existing pieces; includes the study of tape recorders and related sound production techniques such as splicing, editing, dubbing, and recording. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated for a maximum of 9 hours.
243. **Creative Dance for Children.** Introduction to theories and methods of teaching dance to children, grades 1-5; includes twenty-four hours of assistance, observation, and supervised practice teaching in class situations. Prerequisite: Dance 164 and 260, or consent of instructor. 3 hours.
244. **Teaching of Dance to Adolescents and Adults.** Theory and practice in methods of teaching adolescents (grades 6-12) and adults the following dance forms: modern, folk (dances of other cultures, social and square), ballet, jazz, and tap; emphasizes the technical and creative aspects of modern dance; and includes lesson planning,

- curriculum construction, and evaluation. Twenty hours of supervised teaching sessions in the public schools and in community and college situations. Prerequisite: Dance 243 or consent of instructor; Dance 250 or equivalent experience. 3 hours.
245. **Teaching of Dance in the Public Schools.** Examines theory and practice in methods of teaching dance in elementary and secondary schools and in special education programs; provides a minimum of 48 hours of supervised teaching experiences with grades K-12. Prerequisite: Dance 243, 244, or consent of instructor. 4 hours.
246. **Instructional Methods in Dance Education.** Continues methods of teaching dance in public elementary and secondary schools; provides preparation for student teaching. Prerequisite: Dance 245 and concurrent registration in Educational Practice 238/242. 2 hours.
250. **Dance Forms.** Introduction to movement skills and stylistic elements of theatrical and folk forms to be chosen from tap, character, jazz, preclassic and Renaissance forms, and dances of other cultures. Prerequisite: Dance 160 or 166. 1 hour. May be repeated to a maximum of 4 hours.
260. **Modern Technique, II.** A progressive development of the concepts in Dance 160, with emphasis on the qualitative and definitive performance of a variety of technical styles. Prerequisite: Admittance by departmental placement and consent of instructor. 1 to 3 hours. May be repeated to a maximum of 18 hours.
264. **Intermediate Composition.** Experience in choreographing a minimum of one solo and two small group works utilizing various approaches to choreographic form. Prerequisite: Dance 164 or consent of instructor. 2 hours.
266. **Ballet, II.** Intermediate ballet for dance majors; a progressive development of movement concepts and vocabulary in Dance 166, with emphasis on technical development and extended movement combinations. Prerequisite: Departmental placement and consent of instructor. 1 or 2 hours. May be repeated to a maximum of 8 hours.
269. **Music Literature for Dancers.** Basic analysis of representative pieces from the Renaissance, baroque, classical, romantic, and modern periods, emphasizing music of the twentieth century. Students learn to recognize general stylistic characteristics of each period and to understand dance forms related to the music. Prerequisite: Dance 168, or equivalent and consent of instructor. 3 hours.
328. **Composer-Choreographer Workshop.** Same as Music 328. For experienced composers and choreographers; an exploration of the many relationships between musical composition and choreography. Prerequisite: For dance majors, Dance 264 or consent of instructor; for music majors, Music 106 or equivalent, other compositional experience, and consent of instructor. 2 hours or 1/2 unit.
330. **Performance Practicum, II.** Laboratory for the rehearsal and performance of concert works by graduate choreographers, faculty, and guest artists. Prerequisite: Consent of instructor. 1 to 4 hours, or 1/4 to 1 unit (1 or 2 hours, or 1/4 or 1/2 unit per dance). A maximum of 16 hours or 2 units of performance credit (Dance 130, 330, 335) may be counted toward degree requirements.
331. **Production Practicum.** Practical experience in all aspects of the production of dance concerts mounted in the Krannert Center for the Performing Arts and on tour with the Illinois Dance Theatre. Prerequisite: Dance 118, 131, or equivalent, and consent of instructor. 1 or 2 hours, or 1/4 or 1/2 unit (1 hour or 1/4 unit credit per concert up to 2 hours or 1/2 unit per semester). May be repeated to a maximum of 6 hours or 1/2 unit.
335. **Dance Repertory Workshop.** Experience in learning, rehearsing, and perfecting concert dance pieces under the direction of experienced choreographers. Prerequisite: Enrollment in advanced technique course; consent of instructor. 2 or 4 hours, or 1/2 or 1 unit (2 hours or 1/2 unit per dance). A maximum of 16 hours or 2 units of performance credit (Dance 130, 330, 335) may be counted toward degree requirements.

340. **History of Dance, I.** A survey of dance from its beginnings in primitive societies through the early nineteenth century. Prerequisite: Consent of instructor. 3 hours or 1 unit.
341. **History of Dance, II.** A survey tracing the development of dance from the rise of Romanticism through the twentieth century. Prerequisite: Consent of instructor. 3 hours or 1 unit.
346. **Theory and Philosophy of Dance.** Study of the relationship of aesthetic principles and dance theory to a philosophy of dance in education and of dance as a performing art. Prerequisite: Dance 341 or consent of instructor. 3 hours or 1 unit.
347. **Labanotation, I.** Fundamentals of labanotation, including theory, reading, and writing; introduction to effort/shape analysis. Prerequisite: Dance 260 or consent of instructor. 3 hours or 1 unit.
348. **Labanotation, II.** Intermediate level theory and vocabulary of movement notation, including reading, writing, and/or special projects. Prerequisite: Dance 347. 3 hours or 3/4 or 1 unit. Graduate students enrolled for one unit credit will be expected to do additional reading and writing projects.
349. **Movement Notation.** Same as Physical Education 365 and Psychology 312. See Physical Education 365.
351. **Special Problems.** Special projects in research or creative investigation taught on an individual basis. Prerequisite: Completion of independent study proposal and consent of instructor. 2 to 4 hours, or 1/2 or 1 unit. May be repeated for a maximum of 8 hours or 2 units.
360. **Modern Technique, III.** A progressive development of the concepts in Dance 260, with emphasis on virtuosity and versatility. Prerequisite: Admittance by departmental placement and consent of instructor. 1 to 3 hours, or 1/4 or 1/2 unit. May be repeated to a maximum of 18 hours or 2 units.
363. **Improvisation, III.** Advanced improvisational techniques and forms; theory and practice in advanced concepts of creative improvisational human movement as an overt public art form. Prerequisite: Dance 264 or equivalent. 1 hour or 1/4 unit.
365. **Advanced Composition.** Choreography for experienced students, including performance of at least one original work. Prerequisite: Dance 264 or consent of instructor. 2 hours or 1/2 unit.
366. **Ballet, III.** Advanced ballet for dance majors; a progressive development of movement concepts and vocabulary in Dance 266. For dancers of advanced technical level with the ability to execute the ballet vocabulary; includes fundamentals of pointe work. Prerequisite: Departmental placement and consent of instructor. 1 or 2 hours, or 1/4 or 1/2 unit. May be repeated to a maximum of 8 hours or 1 unit.
369. **Accompaniment for Dance.** For dancers and musicians; theory and practice of musical accompaniment for dance, with emphasis on improvisational techniques. Prerequisite: For dance majors, Dance 244 or equivalent, or consent of instructor; for music majors, audition with and consent of instructor. 1 hour or 1/4 unit.
375. **Dance Production Workshop.** Experience in the mounting of a group composition; emphasizes mastery of concert planning and management; and develops skills in costuming, lighting, and public relations. Prerequisite: Dance 365. 2 hours or 1/2 unit.
410. **Professional Seminar.** Survey of professional organizations, publications, scholarly resources, and trends, culminating in student presentation of projects examining current issues in the field. Prerequisite: Graduate standing in dance. 1/2 unit.
420. **Problems in Teaching and Administration.** Recent developments in the teaching of dance, including standards for major programs, curricula planning, performance experiences, administration, evaluation, and theoretical approaches to the teaching of studio courses; experience in the development and presentation of a lecture-demonstration program. Prerequisite: Dance 410; Dance 243 or 244, or equivalent teaching experience. 1 unit.
430. **Dance Touring Company.** A repertory ensemble for the performance of lecture-demonstration programs, off-campus concerts, and short-term residencies;

- rehearsal and performance of works by resident faculty and guest choreographers. Prerequisite: Graduate standing in dance and audition. 1/2 unit. May be repeated to a maximum of 2 units.
431. **Production Practicum.** Practical experience in the technical, design, and administrative aspects of production in conjunction with department concerts. Prerequisite: Graduate standing in dance. 1/2 unit. May be repeated to a maximum of 1 unit.
450. **Independent Research.** Independent research of a historical, contemporary, philosophical, or educational facet of dance under the guidance of a faculty advisor. Prerequisite: Dance 340, 341, 346, and 410, or equivalent and consent of instructor. 1/2 or 1 unit. May be repeated to a maximum of 1 unit.
451. **Supervised Teaching.** Practical teaching experience under the supervision of a faculty member; weekly conference devoted to evaluation and planning. Teaching areas include major and nonmajor university courses and classes for community adults and children. Prerequisite: Graduate standing in dance; Dance 243 and 244, or equivalent. 1/2 to 1 unit. May be repeated to a maximum of 2 units with consent of instructor as topics vary.
460. **Modern Technique, IV.** Modern technique for advanced graduate students. Prerequisite: Graduate standing in dance and placement by technique faculty. 1/4 to 3/4 unit. May be repeated to a maximum of 4 units.
465. **Choreography.** A structured creative utilization of formal choreographic elements in the creation, rehearsal, staging, and performance of original dance works. Prerequisite: Graduate standing in dance and audition. 1/2 unit.
466. **Ballet, IV.** Ballet for advanced graduate students. Prerequisite: Graduate standing in dance and placement by technique faculty. 1/4 to 3/4 unit. May be repeated to a maximum of 4 units.
475. **Costume Design for Dance.** Same as Theatre 475. See Theatre 475.
498. **Creative Project in Dance.** The design, implementation, and completion of a culminating creative project in choreography and/or performance. Prerequisite: Seven units of graduate work in dance, including one unit in choreography. 1 unit. May be repeated to a maximum of 2 units

ECOLOGY, ETHOLOGY, AND EVOLUTION

Head of Department: Professor E. M. Banks

Department Office: 515 Morrill Hall, 505 S. Goodwin, Urbana

105. **The Ecosystem Concept.** Introduction to ecological principles; particular emphasis on man in relation to the global environment; evolution of man and the human ecosystem; and consideration of effects of human population growth, energy production, and natural resource utilization as they affect global cyclic mechanisms. 3 hours.
143. **Biological Bases of Human Behavior.** Same as Anthropology and Human Development and Family Ecology. See Anthropology 143.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
203. **Behavior of Domestic Animals.** Same as Animal Science and Dairy Science 203. See Animal Science 203.
212. **Environmental Biology.** Lecture, discussion, laboratory, and field course dealing with the relationships between organisms and their environment; introduction to physiological bases for adaptations, population dynamics, community organization, and the structure and function of ecosystems. Prerequisite: One year of biology or concurrent registration in Biology 111. 5 hours.
232. **Comparative Vertebrate Anatomy.** Classification and comparative anatomy of vertebrates including functions and evolution of their organs and organ systems. Prerequisite: Biology 111 or equivalent. 5 hours.

246. **Vertebrate Social Organization.** Same as Anthropology, Psychology, and Sociology 246. Introduction to the biosociology of vertebrates; emphasis on the behavioral, physiological, and population aspects of vertebrate social organizations, from fishes to primates. Prerequisite: One year of introductory biology. 3 hours.
290. **Individual Topics.** Laboratory, conferences, and readings. Prerequisite: Two years of life sciences; advanced standing; approval of department. 2 to 5 hours.
301. **Introduction to Evolutionary Biology.** Same as Genetics and Development 301. See Genetics and Development 301.
311. **Evolutionary Ecology.** Emphasizes the evolution of life-history strategies in plants and animals (reproductive rates, life cycles, sex ratios, breeding and mating systems) and the coevolution of animals and plants (pollination, dispersal, and herbivory). Prerequisite: Ecology, Ethology, and Evolution 212. 3 hours or 3/4 unit. Offered in alternate years.
320. **Invertebrate Zoology.** Invertebrates; structure and development; application of biological principles; specific and comparative morphology of the invertebrates; and coordination of structure and function, origin, development, and life histories. Prerequisite: Biology 111 or equivalent. 5 hours or 1 unit.
330. **Ecological Climatology.** Same as Geography 330. Physics of the terrestrial microenvironments of organisms. Insolation, radiation, conduction, and convective transfer of heat and moisture; energy budget analysis; planned modification of microclimate; and interactions of plants, animals, and humans with the atmospheric environment. Primarily descriptive supplemented by elementary calculations. Prerequisite: General college physics of mechanics and heat, and consent of instructor. 3 hours or 3/4 unit.
332. **The Evolution of Adaptive Systems.** Evolutionary mechanisms underlying adaptations; the relationships among theoretical population biology, developmental biology, functional morphology, and the fossil record, with some emphasis on quantitative models. Prerequisite: Biology 210 and consent of instructor; a course in calculus recommended. 3 hours or 3/4 unit.
335. **Ornithology.** Structure, function, ecology, behavior, and evolution of the birds of the world; laboratory devoted to anatomy and identification; and field studies devoted to identification of and research on birds. Optional weekend field trip. Prerequisite: Biology 111 or equivalent. 4 hours or 1 unit. Offered in alternate years.
336. **Mammalogy.** Classification, distribution, life history, evolution, and identification of mammals. Lecture, laboratory, and field work. Prerequisite: Ecology, Ethology, and Evolution 232. 4 hours or 1 unit.
339. **Field Vertebrate Natural History.** Laboratory and field course. An intensive study of North American vertebrates with emphasis on vertebrates of Illinois; taxonomy, life histories, habitats, and feeding habits of all the common resident species. Prerequisite: Credit or concurrent registration in Ecology, Ethology, and Evolution 340, or equivalent; consent of instructor. 4 hours or 1 unit.
340. **Natural History of the Vertebrates.** Lectures on vertebrate adaptations for survival and reproduction. Prerequisite: Biology 111 or equivalent, and junior standing. 3 hours or 3/4 unit.
341. **Field Ecology.** Study of biotic communities, mammals, birds, reptiles, amphibia, fishes, and invertebrates in various sections of North America; outdoor camping and cooking; and transportation in University cars. Prerequisite: Credit or concurrent registration in one of the following: Ecology, Ethology, and Evolution 335, 336, 340, or 345; consent of instructor. 1 hour or 1/4 unit. May be repeated for a maximum of 3 hours.
342. **Fish and Wildlife Ecology.** Application of ecological principles and modeling to management of fish and wildlife populations; significance of abiotic and biotic factors, including life-history parameters in population growth and management; and techniques and procedures for the development of management strategies for animal populations, emphasizing vertebrates. Prerequisite: Ecology, Ethology, and Evolution 212 or equivalent. A course in statistics is highly recommended. 5 hours or 1 unit.

343. **Limnology.** Fresh water biology; study of the lake, pond, and river with emphasis on the physical environment as well as on the plants and animals which live in fresh water. Lectures, discussions, laboratory, and field work. Prerequisite: Biology 111 or equivalent; senior standing or consent of instructor. 5 hours or 1 unit.
344. **Introduction to Primate Morphology and Behavior.** Same as Anthropology 343. See Anthropology 343.
345. **Population and Community Ecology.** Characteristics of populations and their evolution, population dynamics and regulation, and organization and structure of communities; lecture and field research projects. Prerequisite: Ecology, Ethology, and Evolution 212 or consent of instructor. A course in statistics is highly recommended. 5 hours or 1 unit. Offered in alternate years.
346. **Animal Behavior.** Same as Animal Science and Anthropology 346. An introductory course emphasizing how patterns of behavior promote survival and change through evolution, and are modified by the environment. Prerequisite: A one-year course in biology or consent of instructor. 3 hours or 3/4 unit.
347. **Animal Behavior Laboratory.** Same as Animal Science and Anthropology 347. An introduction to observational, statistical, and experimental techniques in the field, through the completion of four projects (sequence analysis, variation in FAP's, acoustic discrimination and orientation, and biological rhythms); formal reports are written for each project. Prerequisite: Ecology, Ethology, and Evolution 346 or consent of instructor. 4 hours or 1 unit.
348. **Wildlife and Land Management.** Same as Forestry 348. Introduces principles of wildlife management; applies those principles to land management problems, especially forestry, range, and agricultural land-uses as they relate to aquatic and terrestrial wildlife; and discusses techniques for evaluating and improving wildlife populations. Prerequisite: Botany 100 and Biology 104, or consent of instructor. 3 hours or 3/4 unit. Credit may not be received for both Ecology, Ethology, and Evolution 342 and 348.
350. **Behavior-Genetic Analysis.** Same as Anthropology and Psychology 342. See Psychology 342.
352. **Behavior Genetics Laboratory.** Same as Anthropology 337 and Psychology 347. See Psychology 347.
353. **Hormones and Behavior.** Same as Psychology 343. Survey of the behavioral effects of hormones in vertebrates and invertebrates; emphasizes the extensive literature on hormonal effects on reproductive and social behavior. Students enrolled for graduate credit may write a term paper for an extra 1/4-unit credit. Prerequisite: Biology 111. 3 hours, or 3/4 or 1 unit.
359. **Aquatic Ecology.** Same as Civil Engineering 347. See Civil Engineering 347.
382. **Advances in Ethology: Behavior of Marine Animals.** A survey of behavioral adaptations and the ecological and evolutionary forces which have shaped them, as revealed by studies upon marine invertebrate and vertebrate groups. Prerequisite: Biology 111 or equivalent; consent of instructor. 3 hours or 3/4 unit.
383. **Advances in Ethology: Behavioral Ecology.** An in-depth examination of areas of current interest at the interface of behavior, ecology, and evolution; focuses on communication, foraging, and social behavior. Prerequisite: Ecology, Ethology, and Evolution 212; Ecology, Ethology, and Evolution 346 or equivalent. 3 hours or 3/4 unit.
407. **Evolutionary Theory.** Genetic, systematic, ecological, and zoogeographical concepts as related to the processes of evolution. Prerequisite: One course in genetics; consent of instructor. 1 unit.
430. **Bioclimatic Modeling.** Same as Geography 430. Quantitative treatment of heat and mass exchanges between organisms and the atmosphere. The energy balance of leaves; models of photosynthetic responses to the atmosphere; heat and mass transfer within and above plant canopies related to phenology and yield; and the energy balances of animals and humans. Prerequisite: Ecology, Ethology, and Evolution 330 and an introductory university course in plant, animal, or human physiology; or consent of instructor. 4 hours or 1 unit.

- 443. Problems in Primate Behavior and Ecology.** Same as Anthropology 443. See Anthropology 443.
- 444. Concepts in Ethology.** Discussion, review, and critical analysis of general concepts and specific problems in behavior with new topics each semester. Prerequisite: Ecology, Ethology, and Evolution 346. 1/2 unit. May be repeated.
- 445. Seminar in Fish and Wildlife Ecology.** Modern ecological principles and concepts to specific problems in fisheries and wildlife. Prerequisite: Ecology, Ethology, and Evolution 342 or 345, or equivalent. 1/2 unit. Offered in alternate years.
- 452. Concepts in Ecology.** Discussion, review, and critical analysis of general concepts and specific problems in ecology with new topics each semester. Prerequisite: An advanced course in ecology or consent of instructor. 1/2 unit. May be repeated.
- 453. Analysis of Ecosystems.** Practical application of statistical techniques and computer technology to ecological problems; emphasis on model building for analysis of population dynamics, and structure and function of ecosystems; and individual problems. Prerequisite: Botany 381, Ecology, Ethology, and Evolution 345 or Entomology 315, Biology 371, Mathematics 120, and Computer Science 121, or consent of instructor. 1 unit. Offered in alternate years.
- 490. Individual Research.** Individual topics in research conducted under the supervision of faculty members in the Department of Ecology, Ethology and Evolution. Prerequisite: Consent of adviser. 1/2 to 3 units.
- 491. Topics in Population Biology.** Seminar course devoted to discussion of problems in population biology, with a different topic each semester. Prerequisite: Consent of instructor. 1/2 unit. May be repeated to a maximum of 4 units

ECONOMICS

Chairperson of Department: Professor P. Uselding

Department Office: 330 Commerce Building (West), 1206 South Sixth, Champaign

- 101. Introduction to Economics.** A general survey of the operation of the economic system; emphasizes the determination of the level of national income, the pricing and allocation of products, and factors of production under existing conditions in the United States. 4 hours.
- 109. Current Economic Problems.** An economic analysis of specific economic problems dealing with poverty, economic development, international economics, and other contemporary issues. Prerequisite: Concurrent registration in Economics 101. 1 hour.
- 171. Introductory Economic Statistics.** An introduction to statistical methods as applied in economics and other social sciences; descriptive statistics, hypothesis testing, and estimation including contingency tables, linear statistical models, and classical time series. For noncommerce students only. Prerequisite: Concurrent registration in Mathematics 134. 3 hours. Students may not receive credit for Economics 171 in addition to Economics 172 and 173, Mathematics 161, or Psychology 115.
- 172. Economic Statistics, I.** An introduction to the modern theory and methodology of statistics in the areas of economics and business; topics include descriptive statistics, probability theory, sampling theory and methodology, sampling distributions, estimation, and hypothesis testing. Prerequisite: Credit or registration in Mathematics 134 or equivalent. 3 hours. Students may not receive credit for Economics 172 if they have received credit for Economics 171 or 272; Mathematics 161, 263, 361, 362, 363, 364, or 366; Agronomy 340; Biology 371, 372, or 373; Educational Psychology 390; Psychology 233, 234, or 235; Sociology 185, 385, or 387; Health Education 391; Forestry 321; Geography 185 or 370; or Social Work 327.
- 173. Economic Statistics, II.** Continuation of Economics 172. Emphasizes estimation and hypothesis testing for the linear statistical model; topics include contingency tables, goodness of fit, single and multiple regression, correlation, Bayesian decision

- theory, time series analysis, and index numbers. Prerequisite: Economics 172; Mathematics 134 or equivalent. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
214. **Government Finance and Taxation.** A general survey of government finance at the federal, state, and local levels, including government expenditures, principles of taxation, intergovernmental fiscal relations, public borrowing, debt management, and fiscal policy for economic stabilization. Prerequisite: Economics 101 or equivalent. 3 hours.
236. **American Economic History.** Traces the course of growth and development of the economy from the colonial period to World War I; emphasizes conceptualization of key issues of the American experience and analysis of significant episodes and turning points. Prerequisite: Economics 101 or consent of instructor. 3 hours.
237. **Contemporary Western Europe.** Same as History 237. See History 237.
238. **European Economic History.** Economic structure and development of Europe since 1000 with respect to agriculture, industry, trade, technology, finance, and government; emphasis on those forces which contribute to the economic development of Europe and on the spread of these forces throughout the world. Prerequisite: Economics 101 or consent of instructor. 3 hours.
240. **Labor Problems.** Survey of the problems and analysis of U.S. labor markets and unions; topics include labor force participation, occupations, hours, wage determination, development and attributes of U.S. labor unions, and overview of collective bargaining and the effects of unions, unemployment, wages and inflation, and racial and sex discrimination; and selected current policy problems. Prerequisite: Economics 101. 3 hours.
245. **Women in the Labor Market.** Changing role of women in the labor market and the economy; supply and demand for women in the 1970s: nature, extent, and legal remedies for sex discrimination in employment; "earnings gaps" and variable employment costs, men versus women; new role of multi-earner families; and comparative use of women as a professional resource. Prerequisite: Economics 101 or equivalent. 3 hours.
255. **Comparative Economic Systems.** Analysis of the significant similarities and differences in the development, structure, and policies of capitalism, communism, and market socialism. Prerequisite: Economics 101 or equivalent. 3 hours.
272. **Introduction to Econometrics.** Study of statistical models and methods used in estimating the parameters of economic relations. Prerequisite: Mathematics 134 and Economics 173. 3 hours.
288. **Government Regulation of Economic Activity.** Analysis of the economic bases, policies, and consequences of government regulation of economic activity; patterns of regulation in selected areas. Prerequisite: Economics 101. 3 hours.
294. **Senior Research.** A research and readings course for students majoring in economics; may be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Cumulative grade-point average of 4.0 or honors in the junior year, or consent of instructor; senior standing. 2 to 4 hours.
295. **Senior Research.** A research and readings course for students majoring in economics; may be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Cumulative grade-point average of 4.0 or honors in the junior year; senior standing. 2 to 4 hours.
299. **Undergraduate Open Seminar, II.** An independent study course covering topics not treated by regular course offerings. Requests for activation of this course may be made by students or by faculty and should be directed to the head of the department. While credit toward graduation is normally granted for this course, credit toward satisfying specific college or departmental requirements is contingent upon approval by the appropriate college or departmental committee. Prerequisite: Junior or senior standing; Economics 101 or equivalent recommended. 0 to 9 hours. May be repeated.
300. **Intermediate Microeconomic Theory.** Microeconomic analysis including value and distribution theory; analysis of the pricing of the factors of production integrated

- in a micro-general equilibrium context which builds towards explaining the resource allocation process. Prerequisite: Economics 101 or equivalent. 3 hours, or 1/2 or 3/4 unit. Students may not receive graduate credit for both Economics 300 and Business Administration 400. Upon recommendation by the adviser and approval by the Department of Economics, a noneconomics major may receive up to 3/4 unit. Graduate credit for both Economics 300 and 400 is given only upon recommendation of the student's adviser and approval by the Department of Economics.
301. **Intermediate Macroeconomic Theory.** The modern theory of the determination of the level and rate of growth of income, employment, output, and the price level; discussion of alternate fiscal and monetary policies to facilitate full employment and economic growth. Prerequisite: Economics 101 or equivalent. 3 hours, or 1/2 or 3/4 unit. Students may not receive credit for both Economics 301 and Business Administration 401. Upon recommendation by the adviser and approval by the Department of Economics, a noneconomics major may receive up to 3/4 unit. Graduate credit for both Economics 301 and 401 is given only upon recommendation of the student's adviser and approval by the Department of Economics.
306. **History of Economic Thought.** The development of economics; the examination of contributions of individual writers and schools of thought as they influenced economic thought and national policy. Prerequisite: Economics 101 or equivalent; senior standing. 3 hours or 1/2 unit.
312. **Economic Dynamics and Growth.** Analysis of the causes of economic instability; the requirements for economic growth in the national economy; and a consideration of public policy relating to instability and growth. Prerequisite: Economics 101 or equivalent; Economics 301. 3 hours, or 1/2 or 1 unit.
313. **Economics of Consumption.** Same as Family and Consumer Economics 313. See Family and Consumer Economics 313.
315. **The Economics of Poverty and Income Maintenance.** Same as Labor and Industrial Relations 315. Analysis of the nature and causes of poverty with special emphasis on critical evaluation of programs to combat poverty in the United States. Prerequisite: Economics 101 or equivalent. 3 hours, or 1/2 or 1 unit.
328. **International Economics.** Introduction to the theory of international trade and finance with selected application to current problems of commercial policy, balance of payments adjustment, and the international monetary system. Prerequisite: Economics 101 or equivalent. 3 hours, or 1/2 or 1 unit.
329. **Contemporary Issues in the International Economy.** Analysis in depth of selected current issues and policy problems of the international economy, including (but not restricted to) the following: new approaches to the theory of international trade, reform of the international monetary system, role of the General Agreement on Tariffs and Trade and the United Nations Conference on Trade and Development in expanding trade between developed and undeveloped economies, problems of stabilizing international commodity markets, and balance of payments problems of the United States and other selected countries. Prerequisite: Economics 328 or equivalent. 3 hours, or 1/2 or 1 unit.
337. **Economic History of American Agriculture.** Same as Agricultural Economics and History 337. See Agricultural Economics 337.
341. **Economics of Labor Markets.** Same as Labor and Industrial Relations 341. A study of the microeconomic determinants of labor demand and supply, economic effects of unions, and macroeconomic labor market problems. Prerequisite: Economics 101. 3 hours, or 1/2 or 1 unit.
343. **Unions, Bargaining, and Public Policy.** Analysis of the legal background and economic issues associated with unions and collective bargaining in the United States including theory of the labor movement; process of union wage determination; analysis of strikes; background, strategies, and principal issues in collective bargaining; and problems and policies of government intervention. Prerequisite: Economics 101 or equivalent. 3 hours, or 1/2 or 1 unit.
345. **Economics of Human Resources.** Same as Labor and Industrial Relations 345. Education and training in economic growth; labor force characteristics; occupational

- structure and future human resources requirements; job information networks; economics of discrimination and underutilization; national human resources policies and programs; and private industry and union human resources planning. Prerequisite: Economics 101 or equivalent. 3 hours, or 1/2 or 1 unit. Graduate credit is not given for both Economics 345 and 444.
346. **Family Economics.** Same as Agricultural Economics 370 and Family and Consumer Economics 370. See Family and Consumer Economics 370.
350. **The Developing Economies.** Analysis of the economic problems associated with newly developing nations; emphasis on their economic structures, their factor scarcities, and their programs for development. Not open for graduate credit for graduate candidates in economics. Prerequisite: Economics 101 or equivalent. 3 hours, or 1/2 to 1 unit. Graduate credit is not given for both Economics 350 and Economics 450 or 451.
351. **The Development of the Japanese Economy.** An analysis of Japan's international trade, economic structure, standards of living policy-making process, and future prospect; additional attention to U.S.-Japanese economic relations and Japan's role in Asia. Prerequisite: Economics 101 or consent of instructor. 3 hours, or 1/2 or 1 unit.
352. **Economic Development in Latin America.** Same as Agricultural Economics 352. Study of economic activity and the processes of diversification and industrialization in Latin America, with comparative analysis of selected countries. Prerequisite: Economics 101 or consent of instructor. 3 hours, or 1/2 or 1 unit.
353. **Economic Development in India and Southeast Asia.** Same as Agricultural Economics 353. See Agricultural Economics 353.
354. **Economic Development of Tropical Africa.** Same as Agricultural Economics 354. See Agricultural Economics 354.
356. **Economics of Population and Resources.** Same as Sociology 356. Interactions of population size with output, natural and man-made resources, and environment; various policies for management of these interrelated elements; and economics of demographic change. Considers both more developed and less developed countries. Prerequisite: Junior standing or consent of instructor. Economics 101 is recommended. 3 hours, or 1/2 or 1 unit.
357. **The Soviet Economy.** Analytical survey of Soviet economic development; structure and performance of the economy; and problems of planning and control. Prerequisite: Economics 101 or consent of instructor. 3 hours, or 1/2 or 1 unit.
358. **The Economy of China.** Discussion of changes in the patterns of production, exchange, and distribution in Communist China, with emphasis on their relation to social transformation; survey of Chinese economic history over the past century, dealing with the institutional background to and the structure of economic activities in China. Prerequisite: Economics 101 or consent of instructor. 3 hours, or 1/2 or 1 unit.
359. **The Israeli Economy.** An analysis of the economic structures, policies, and performance of modern Israel, emphasizing the pre-1948 Palestine economy; the development of the Histadrut, Kibbutz, and Moshav; the economic relations between Arab and Jewish populations; and the impact of post-1948 immigration on Israel's economic development. Prerequisite: Economics 101 or consent of instructor. 3 hours, or 1/2 to 1 unit.
360. **Regional Economic Development.** Survey of the theory and problems of regional economic development, including regional accounts, interregional income and trade theory, principles of the location of economic activity, theories of regional growth, and public policy for development of regions. Prerequisite: Economics 101 or equivalent. 3 hours, or 1/2 or 1 unit.
361. **Urban Economics.** Same as Finance 367. Analysis of the urban economy. The theory of urban spatial structure; the theory of local public finance, pricing, and investment decisions in the urban public sector; and the application of cost-benefit analysis and user-charge pricing to such problems as housing, transportation,

- land-use controls, and pollution. Prerequisite: Economics 101 or equivalent; Economics 300 is recommended. 3 hours, or 1/2 or 1 unit.
374. **Mathematical Economics, I.** Mathematical reformulation and interpretation of traditional economic theory. Prerequisite: Mathematics 241 and Economics 300 and 301. 3 hours, or 1/2 to 1 unit.
375. **Mathematical Economics, II.** Introduction to linear and nonlinear economic models; emphasis on the formulation and interpretation of modern economic theory and welfare economics. Prerequisite: Mathematics 124 or 315; Mathematics 241; and Economics 300. 3 hours, or 1/2 to 1 unit.
384. **Economics of Transportation.** Economic aspects of the transportation industry with special emphasis on problems of regulation and public policy. Prerequisite: Economics 101 or equivalent. 3 hours, or 1/2 or 1 unit.
386. **Current Transportation Problems.** Analytical and critical study of selected problems of current interest in transportation. Prerequisite: Economics 384 or consent of instructor. 3 hours, or 1/2 or 1 unit.
388. **Law and Economics.** Applications of economic theory to problems and issues in both civil and criminal law and the effect of legal rules on the allocation of resources; includes property rights, liability and negligence assignment, the use of administrative and common law to mitigate market failure, and the logic of private versus public law enforcement. Prerequisite: Economics 300 or equivalent. 3 hours or 1/2 or 1 unit.
389. **Industrial Competition and Monopoly.** The organization and tactics of market control; the development of antitrust law and policy; public policy regarding competitive practices; special policies applying to natural resource industries; and regulated monopoly and government ownership as alternatives to the antitrust approach. Prerequisite: Economics 101 or equivalent. 3 hours, or 1/2 or 1 unit.
400. **General Economic Theory.** Emphasis on microeconomic theory; principal topics include a review of value and distribution theory, the theory of choice by households and firms, general microeconomic theory, and theoretical developments of current interest; and attention given to empirical studies intended to affirm or disaffirm economic principles. Intended for minors in economics and others who have a minimum preparation for graduate study in economics. Prerequisite: Economics 101 or equivalent. 1 unit. Students may not receive credit for both Economics 400 and Business Administration 400. Graduate credit for both Economics 300 and 400 is given only upon recommendation of the student's adviser and approval by the Department of Economics.
401. **General Economic Theory.** Emphasis on macroeconomic theory; principal topics include a review of Keynesian macroeconomic theory, formal growth theory, and selected business cycle theory. Intended for minors in economics and others who have a minimum preparation for graduate study in economics. Prerequisite: Economics 101 or equivalent. 1 unit. Students may not receive credit for both Economics 401 and Business Administration 401. Graduate credit for both Economics 301 and 401 is given only upon recommendation of the student's adviser and approval by the Department of Economics.
402. **Microeconomic Theory, I.** Introduction to the models and methods of modern microeconomic theory, concentrating on individual and firm decision making and on industry equilibrium; brief treatment of general equilibrium theory and welfare analysis. Topics include: consumer utility and demand theory; production and cost functions; firm supply, input demand, and price behavior; competitive, monopolistic, and oligopolistic industry analysis; and distribution theory. Prerequisite: Economics 300 and 301, or equivalent; calculus. 1 unit.
403. **Macroeconomic Theory, I.** Development of modern macroeconomic theory, including national income accounts and their relation to input-output tables; classical, Keynesian, and monetarist aggregate models; behavior hypotheses of consumption, investment, and government; properties and the role of money and interest; foreign trade and investment; price rigidity, price flexibility, and

- employment; wage-price interaction and inflation; and ad hoc stabilization models. Prerequisite: Economics 300 and 301, or equivalent; calculus. 1 unit.
404. **Microeconomic Theory, II.** General market equilibrium theory and welfare economics; discusses the problems of existence, stability, efficiency, and equity of economic equilibrium; and introduces social choice and the special problems created by public goods, externalities, and uncertainty. Prerequisite: Economics 402. 1 unit.
405. **Macroeconomic Theory, II.** Development of modern macroeconomic theory, including disequilibrium theory, optimal short-term stabilization measures, and monetary, fiscal, incomes, and exchange rate policies; large-scale econometric models; linear and neoclassical growth models; aggregate distribution theory; money, capital movements, trade, and growth; optimal growth models; and exhaustible resources and growth. Prerequisite: Economics 403. 1 unit.
406. **History of Economic Thought.** Analysis of economic thought from the Physiocrats to World War II; evaluation of the selected materials both as reflections of their times and as contributions to contemporary economic thought. Prerequisite: Economics 300 and 301, or equivalent. 1 unit.
408. **Philosophical Problems in Economics.** Study of philosophical problems in economics, with some emphasis on the methodology and epistemology of economic theory; use of the views of leading economists to show the development of broad philosophical problems of economic theory, the relation of theory and certain of its applied areas, and the relation of economics to other selected disciplines. These problems are treated in the light of modern philosophy. Prerequisite: One unit either in economic theory or in the history of economic thought. 1 unit.
409. **Marxian Economics.** Analysis of Marx's economic theory and predictions; concentration on a critical evaluation of Marx's economic theory, a survey of contributions to the theory since Marx, and a Marxist evaluation of the neoclassical synthesis. Prerequisite: Economics 300 and 301, or consent of instructor. 1 unit.
410. **Advanced Topics in Economic Theory, I.** Study at an advanced level of one or more of the following possible topics: economics of externalities, advanced aggregate economic theory, theory of central planning, investment theory, consumer behavior theory, capital theory, welfare economics, inflation theory, income distribution theory, or other topics. Prerequisite: Economics 402 and 403, or consent of instructor. 1 unit. May be repeated.
411. **Advanced Topics in Economic Theory, II.** Study at an advanced level of one or more of the following possible topics: economics of externalities, advanced aggregate economic theory, theory of central planning, investment theory, consumer behavior theory, capital theory, welfare economics, inflation theory, income distribution theory, or other topics. Prerequisite: Economics 402 and 403, or consent of instructor. 1 unit. May be repeated.
414. **Public Finance.** Analysis of government expenditures and decision making; the budgetary process; fiscal policy; government borrowing and debt management; intergovernmental fiscal relations; pricing of government services; and public finance in developing economies. Prerequisite: Six hours of economics. 1 unit.
415. **Taxation: Economics and Policy.** Sources of government revenue; principles of taxation; tax incidence; economic effects and optimal structures of the major types of taxes (income, sales and excise, estate, property); tax reform; and taxation in developing economies. Designed primarily for graduate students outside of economics. Prerequisite: Six hours of economics. 1 unit.
416. **Public Goods Theory.** An analysis of the theory of public goods; includes welfare economics, externality, and market failure; and applications to cost benefit analysis, optimal taxation, public choice, fiscal federalism, and income distribution. Prerequisite: Economics 402. 1 unit.
417. **Economics of Taxation.** A theoretical and empirical analysis of the impact of taxation on the economic system; topics include taxation and the satisfaction of collective wants, the ability to pay theory of taxation, the theory of tax incidence, excess burden and efficiency effects of taxation, effects of taxation on work, saving, and investment, and optimal taxation. Prerequisite: Economics 402. 1 unit.

- 418. Economics of Education, Health, and Human Capital.** Same as Administration, Higher and Continuing Education 418. Basic economic analysis of human capital and the value of human time, with applications to the economics of education and health; theory and analysis of consumer investment in human and physical capital over the life cycle; the returns to education and health, and their effects on growth; the theory of nonmarket time; public finance of education and health; and implications for the analysis of the distribution of income. Prerequisite: A course in microeconomic theory and a course in statistics, or consent of instructor. 1 unit.
- 420. Monetary Theory.** Micro- and macroeconomic theories of the supply of and demand for money; money substitutes and their significance; review of current empirical research; money in closed economy, macroeconomic, and static general equilibrium models; and analysis of inflation and unemployment. Prerequisite: Consent of instructor. 1 unit.
- 421. The Theory of Monetary Policy.** Monetarism and other current topics; stabilization policy; money in dynamic models; money in open economy macroeconomic models; and international aspects of monetary theory. Prerequisite: Consent of instructor. 1 unit.
- 425. Macroaccounting.** Same as Accountancy 455. See Accountancy 455.
- 428. International Trade Theory.** Development and use of the neoclassical theory of international trade for the analysis of tariffs, customs, unions, and the effects of trade on the distribution of income and welfare; analysis and use of the relations between the balance of payments and national income to study the role of income changes combined with price changes in the balance of payments adjustment process. Prerequisite: Economics 300 and 301, or equivalent. 1 unit.
- 429. International Trade Policy.** Concepts of balance of payments equilibrium, the foreign exchange market and the theory of capital movements; current problems and policies related to balance of payments disequilibrium, trade policy, and the functioning of the international monetary system. Prerequisite: Economics 300 and 301, or equivalent. 1 unit.
- 436. American Economic History.** Emphasizes, but is not limited to, the reading and criticism of current literature in American economic history; attempts to facilitate understanding of the use of economic analysis in interpreting events framed in historical context; includes British colonial policy, trade and tariffs, industrialization, technology, slavery and the southern economy, land policy, agriculture, transportation and internal improvements, capital mobilization and financial organization, and the measurement of economic growth. Prerequisite: Graduate standing in economics or consent of instructor. 1 unit.
- 437. General Economic History.** Treatment of selected topics in the economic history of industrialized economies by applying economic theory and quantitative methods of analysis to historical problems; exploration of the implications for contemporary work in economics. Prerequisite: Graduate standing in economics or consent of instructor. 1 unit.
- 438. Economic History of Europe.** Major lines of development since 1450; comparative study of forces and institutions inimical or favorable to growth; and selected readings on organization of economic activity, role of governments and the entrepreneur, commercial policy, monetary systems, land tenure, process of capital formation, industrialization, etc. Prerequisite: Consent of instructor. 1 unit.
- 440. Labor Economics.** Same as Labor and Industrial Relations 440. Survey of recent trends in the labor force, of real and money earnings, and of the distribution of national income used as the basis for a critical economic analysis of contemporary English and American wage theory. Prerequisite: Economics 300 and 301. 1 unit.
- 441. Labor Economics.** Same as Labor and Industrial Relations 441. Economic issues and implications involved in hours of work, employment and unemployment, and trade union institutionalism (the impact of the trade union upon the basic institution of a free enterprise economy); emphasis in all cases on the development of appropriate public policy. Prerequisite: Economics 300 and 301. 1 unit.

442. **Collective Bargaining.** Same as Labor and Industrial Relations 442. See Labor and Industrial Relations 442.
443. **Problems and Practices of Labor Dispute Settlement.** Same as Labor and Industrial Relations 443 and Law 343. See Labor and Industrial Relations 443.
444. **Problems and Policies in Human Resources.** Same as Labor and Industrial Relations 444. Emergence of the human resources issue; population as a resource base; the labor force: measurement and characteristics, behavior under changing income, employment, and technology; women as the dynamic factor in labor force growth; problems of utilization of labor force components: intellectual resources, older workers, and manual, nonmanual, black, and marginal forces; and issues of national educational and training policy. Prerequisite: Consent of instructor. 1 unit. Graduate credit is not given for both Economics/Labor and Industrial Relations 444 and 345.
447. **Labor Union Organization and Administration.** Same as Labor and Industrial Relations 447. See Labor and Industrial Relations 447.
450. **The Economics of Development and Growth.** Review and analysis of the theories and patterns of growth in developed and underdeveloped economies; consideration of the problems and methods of measuring growth; critical examination of the variables thought to be strategic in the growth process; and exploration of the policy implications of different theories. Prerequisite: Economics 300 and 301, or equivalent. 1 unit.
451. **The Developing Economies.** Analysis of the newly developing economies, with emphasis on institutional factors affecting development and economic policy relating to development. Prerequisite: Economics 450. 1 unit.
455. **Comparative Economic Systems.** Comparative analysis of the structures and policies of market-directed and planned economies. Prerequisite: Economics 101 or equivalent. 1 unit.
457. **Economic Planning in the Soviet Union and Eastern Europe.** Intensive examination of the structure and performance of the Soviet and the East European economies, emphasizing analysis of the main theoretic and operational dimensions of economic planning; evaluation of choice, design, and efficacy of central planning instruments from both theoretical and historical perspectives. Prerequisite: Economics 300 and 301, or 357, or consent of instructor. 1 unit.
460. **Urban Economics and Location Theory.** The microeconomic theory of urban spatial structure. Additional topics are chosen from among the following: the "new" urban economics, the theory of local public goods, spatial theories of the firm, dynamic urban models, urban public policy issues, the assignment problem, and spatial linear programming models. Prerequisite: Economics 402. 1 unit.
461. **Urban and Regional Economic Development.** Measurement and analysis of interregional differences in economic growth. Prerequisite: Economics 300 and 301. 1 unit.
463. **Natural Resource Economics.** Same as Agricultural Economics, Environmental Studies, and Forestry 463. See Agricultural Economics 463.
464. **Environmental Economics: Theory and Applications.** Same as Agricultural Economics and Environmental Studies 464. Examines both theory and policy applications in the environmental area; selectively reviews the literature to provide a framework for understanding the relevant economic relationships and the criteria appropriate for policy assessment; emphasizes the characteristics of major environmental problems and policy choices; and considers the valuation of environmental amenities and the conflict between environmental quality and growth. Prerequisite: Economics 300 or consent of instructor. 1 unit.
467. **Mathematical Economics, I: Statics.** Study of quantitative techniques useful in economic analysis and decision making; mathematical programming; input-output analysis; point-set theory and game theory; existence, optimality, and stability conditions for static general equilibrium; and activity analysis, including welfare economics. Prerequisite: Mathematics 315; Economics 402 and 403, or equivalent. 1 unit.

- 468. Mathematical Economics, II: Dynamics.** Study of quantitative techniques useful in economic analysis and decision making; single and systems of difference and differential equations; dynamic programming; Pontryagin maximum principle; interaction of multiplier and accelerator; von Neumann model; Turnpike theorem; growth models; and control systems. Prerequisite: Mathematics 315; Economics 402 and 403, or equivalent. 1 unit.
- 470. Economic Statistics.** Classical statistics and regression analysis; descriptive statistics, probability and point and interval estimation; decision theory; variance analysis; and linear regression and least-squares estimates. Prerequisite: A course in statistics or consent of instructor. 1 unit.
- 471. Econometric Analysis.** Part 1: the construction of econometric models; characteristics of models and choice of estimating methods; and estimates of parameters by various methods. Part 2: Bayesian statistics and decision theory. Prerequisite: Economics 470 or equivalent. 1 unit.
- 472. Applied Econometrics.** Develops a general methodological basis for searching for quantitative economic knowledge; integrates and gives operational content to the topics of economic, statistical, and econometric theory. Prerequisite: Economics 471 or 476, or equivalent. 1 unit.
- 473. Time Series Analysis in Economics.** Modern time series analysis techniques for handling economic data which arises in a happenstance fashion through time and their application to specific economic problems. Prerequisite: Economics 471 or Mathematics 478, or equivalent. 1 unit.
- 476. Econometrics, I.** Estimation of parameters for single- equation models; tests of hypotheses and confidence regions for regression models; large-sample theory in single-equation models; and Bayesian statistics in regression models. Prerequisite: Mathematics 315 and 363. 1 unit.
- 477. Econometrics, II.** Consideration of the specification of models with systems of simultaneous equations; identification problem, distributed lag models, K-class estimators, maximum likelihood estimators, three-stage least-squares, and effects of specification errors. Prerequisite: Economics 476. 1 unit.
- 478. Bayesian Inference in Econometrics.** Examines some standard econometric problems from the Bayesian perspective and compares Bayesian and classical inference. Prerequisite: Economics 476 or equivalent. 1 unit.
- 479. Research Seminar in Quantitative Economics.** Significant work in the area of quantitative economics is reported and explored by members of the instructional staff, by guest speakers from academic, governmental, and industrial centers, and by graduate students in the second year of their work who are assigned projects. Prerequisite: The equivalent of one year of graduate statistics (theoretical or applied). 1 unit. (Credit for second-year students only.)
- 480. Industrial Organization.** Theory of the organization of markets and firms, behavior of firms, functioning of competitive systems, and performance of markets. 1 unit.
- 481. Anti-Trust and Business Policy.** Economic analysis of public policy for market structure and conduct; topics include anti- trust and mergers, predatory pricing, advertising, and technological advance. Prerequisite: Economics 480. 1 unit.
- 482. Government Regulation of Industry.** Microeconomic and econometric analyses of market failure and government response in selected industries; topics include economic effect of regulation, bureaucratic behavior, optimal policy, and strategies for regulatory reform. Prerequisite: Economics 402; Economics 480; or consent of instructor. 1 unit.
- 490. Individual Study and Research.** Directed reading and research. 1/4 to 1 unit.
- 491. Workshop and Research Seminar.** Workshops are offered in all areas of specialization in which graduate students are writing Ph.D. dissertations. The specific format varies, but in general workshop sessions include presentations by graduate students of thesis research, by faculty members of their current research, and by occasional outside speakers. Prerequisite: Admission to the Department of

Economics Ph.D. program. 1/2 unit. One unit of Economics 491 is required of all students in the Ph.D. program.

- 499. Thesis Research.** Preparation of thesis required of all students writing master's or doctoral theses in economics. 0 to 4 units

EDUCATION

Dean of College: Professor J. R. Burnett

College Office: 110 Education Building, 1310 South Sixth, Champaign

- 100. Education Practicum.** A laboratory course involving work in school and research projects of the instructor's choosing. For those who choose this option, it is taken in conjunction with Speech Communication 111 and 112, and Educational Policy Studies 201. 4 hours.
- 101. Education Practicum.** Continuation of Education 100. Prerequisite: Education 100 or consent of instructor. 4 hours.
- 111. Introduction to Education.** Introduces American public education, especially the goals, organization, structure and finance of schooling, and some of the typical problems teachers face. 1 hour.
- 112. Contemporary Issues in Education.** In depth analysis of how the issues of racism, sexism, IQ, bilingual/bicultural education, and mainstreaming impact on public schooling in the United States. Prerequisite: Education 111. 1 hour.
- 113. The Nature of Teaching.** Examines the general nature of the activity called teaching and the nature of the occupation of teaching in the United States; exposes students to various views of the concept of teaching, styles of teaching, teacher characteristics, the nature of the work itself, and an overview of the teacher's "role set." Prerequisite: Education 112. 2 hours.
- 114. Field Experience in Education.** Provides students with practical field experience in education; places students considering teaching as a career in public school classrooms where they will have a limited "hand on" experience; and provides students who have decided against teaching as a career the opportunity to investigate educational issues of interest to them under the supervision of the instructor. Prerequisite: Education 113. 1 hour.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 350. Exceptional Students in Regular Programs.** Instruction for prospective regular classroom teachers on the psychology and identification of exceptional children, including the learning disabled; methods of instruction for the exceptional child. Prerequisite: Degree candidate in a program approved by the Council on Teacher Education. 3 hours or 1 unit.
- 400. Methods of Educational Inquiry.** Critical consideration of research concepts and methods used in alternative means of contemporary educational inquiry. 0 or 1 unit.
- 449. Independent Study.** Offers opportunity of self-directed independent study, that is, develops the individual's ability as an independent student and enables the student to pursue interdisciplinary studies for which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the associate dean for graduate programs prior to enrollment. 1/2 or 1 unit. Not more than 2 units may be counted toward an advanced degree except by consent of the dean of the College of Education.
- 499. Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units

EDUCATIONAL POLICY STUDIES

Chairperson of Department: Professor C. J. Karier

Department Office: 360 Education Building, 1310 South Sixth, Champaign

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Foundations of American Education.** A study of some of the problems of formulating and justifying aims and policies in American education, of designing and systematizing the curriculum, of organization and social context of the public school system, and of the teaching-learning process; examined in terms of perspectives provided by social philosophy, history, sociology, and philosophy of education. 3 hours.
249. **Independent Study.** Designed for students who wish to do advanced readings and research in greater depth and to investigate further ideas and themes that have been explored in Educational Policy Studies 199 and 201. Prerequisite: Educational Policy Studies 201; interest as attested to by instructors; and consent of adviser and staff member who supervises the work. 2 hours.
291. **Thesis.** Prerequisite: Senior standing. 2 hours.
292. **Thesis.** Prerequisite: Senior standing. 2 hours.
299. **Undergraduate Seminar in Educational Policy Studies.** An advanced undergraduate seminar that builds upon introductory work in Educational Policy Studies 201 and includes historical, philosophical, legal, and social science perspectives on education. Requests for activation of this course may come from students or faculty. Prerequisite: Educational Policy Studies 201 or equivalent, and consent of instructor. 0 to 9 hours. May be repeated.
300. **The History of Education.** Brief introductory survey of ancient and medieval education followed by a more extended study of educational developments since the Italian Renaissance; emphasis on the relation of educational trends to broader social, economic, political, and intellectual movements. Prerequisite: Junior standing. 3 hours or 1/2 unit.
301. **Philosophy of Education.** Philosophical examination of selected educational issues; conveys a grasp of the complexities of the issues and some philosophical methods for dealing with them. 2 to 4 hours, or 1/2 to 1 unit.
302. **History of American Education.** The development of American education in relation to political, social, and cultural developments; attention to the influence of movements in the cultural environment upon evolving conceptions of educational theory and practice. 2 to 4 hours, or 1/2 to 1 unit.
303. **Comparative Education.** Introduction to the cross-cultural, cross-national study of educational institutions and their relationship to society. Topics may vary. 2 to 4 hours, or 1/2 to 1 unit.
304. **Social Foundations of Education.** Introductory survey of the interrelationship between school and society, and of the impact on public education of the major social trends and forces operating in our society. 2 to 4 hours, or 1/2 to 1 unit.
305. **History of Educational Ideas.** Study of selected educational theorists and intellectual movements; provides familiarity with the major educational ideas of the past and historical perspectives on current issues and problems in education; and readings in such authors as Aristotle, Plato, Quintilian, St. Augustine, Loyola, Comenius, Rousseau, Pestalozzi, Froebel, Herbart, and Dewey. 2 to 4 hours, or 1/2 to 1 unit.
306. **Aesthetics, The Arts, and Education.** Theoretical introduction to the problems involved in teaching critical appreciation of the arts; examines materials from aesthetics, art history, and criticism for their relevance to the problems of aims, curriculum, organization, and teaching-learning. 2 to 4 hours, or 1/2 to 1 unit.
307. **Aesthetics, Mass Communications, and Education.** Theoretical introduction to the problems involved in teaching a critical understanding of mass communications; examines materials from aesthetics, communication theory, and the social sciences for

- their relevance to the problems of aims, curriculum, organization, and teaching-learning. 2 to 4 hours, or 1/2 to 1 unit.
309. **The Politics of Education.** An overview of the political structure and processes through which many of the major issues in education are treated; analyzes nature of the policymaking process in education and discusses the roles of principal participants in the process of educational decision making, but focuses on fundamental recurring issues in education and the ways these issues have been resolved or not resolved by the overall system. Particular attention to the role that both the federal and state judiciary as well as legislative authority have had in shaping educational policy. 2 to 4 hours, or 1/2 to 1 unit.
310. **Economics of Education.** An introduction to economic concepts and their application to education, including investment and consumption theories of education and the role of human capital in economic growth and development; cost-benefit analyses in education, education and the distribution of income, and manpower and educational planning. Prerequisite: Consent of instructor. 2 to 4 hours, or 1/2 to 1 unit.
315. **Sociology of Education.** Same as Sociology 315. Education as a social process in various cultures and historical periods, emphasizing current systems in Westernized countries. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or 1/2 or 1 unit.
385. **Anthropology of Education.** Same as Anthropology and Educational Psychology 385. Introduction to the contribution of anthropology to the cross-cultural study of education, including discussion of material from representative cultures ranging from primitive social groups to present-day national states; special attention to education of minority ethnic and subordinate cultures; and emphasis on both informal and formal education as cultural process in relation to culture transmission, evolution, change, and development. Prerequisite: A course in anthropology or sociology, or consent of instructor. 2 or 4 hours, or 1/2 or 1 unit.
386. **Education and International Relations.** Analysis of the role of education in international relations, emphasizing the study of educational innovation through the help of change agents. Prerequisite: Educational Policy Studies 303 or consent of instructor. 2 to 4 hours, or 1/2 to 1 unit.
399. **Issues and Developments in Educational Policy Studies.** Seminar on topics not treated by regularly scheduled courses; requests for initiation may be made by students or faculty members. 2 to 4 hours, or 1/2 to 1 unit. May be repeated to a maximum of 8 hours or 2 units.
400. **Problems of Educational Theory.** Analysis of the kinds of problems encountered in constructing an educational theory, and of relations between educational theory and other disciplines, especially philosophy and the social sciences. Prerequisite: Educational Policy Studies 301 or equivalent; consent of instructor. 1 unit.
401. **Modern Theories of Education.** Critical analysis of the theories of educational research and practice as found in contrasting traditions of educational thought. Prerequisite: Educational Policy Studies 301 or equivalent; consent of instructor. 1 unit.
402. **Educational Movements in the Twentieth Century.** Historical study of significant educational trends during the past sixty years, with special reference to their influence on American education; an analytical examination of the principal transition movements in the last decade of the nineteenth century and of efforts to solve the problems since 1900. 1 unit.
403. **The Historical Foundations of American Educational Thought.** Study of the evolution of educational theories and philosophies since the eighteenth century; particular reference to their impact upon educational developments in the United States; a broad view of the general growth of American educational thought; and attention to selected major educational theorists, or schools of thought, exploration of their fundamental ideas, and the relation of these ideas to significant intellectual currents in American culture. Prerequisite: Consent of instructor. 1 unit.

404. **Seminar in Educational Classics.** Reading and group discussion of a limited number of the most important writings in educational philosophy which have had a profound influence on the progress of educational thought and practice. Prerequisite: Educational Policy Studies 305 or equivalent; consent of instructor. 1 unit.
405. **Foundations of Aesthetic Education.** Philosophical approach to the problems of teaching for appreciation in formal education; appraisal of the status of aesthetic education, its nature and function, and its relation to other types of education. Prerequisite: Educational Policy Studies 306 or equivalent. 1 unit.
406. **Seminar in the History of Education.** Intensive group study of a small number of selected problems to assist individual students to develop an understanding of and the ability to use the techniques of historical research in furthering such study; problems studied are selected in the light of the interests and previous training of the group of students enrolled. Prerequisite: Two courses in the history of education or consent of instructor. 1 unit.
407. **Logical Foundations of Methods.** Study of the application of principles of logic (broadly construed) to methods and curriculum at all levels. Prerequisite: A course in philosophy of education and teaching experience, or consent of instructor. 1 unit.
408. **Epistemology in Education.** Exploration of knowledge and inquiry as they relate to problems of formulating educational policy, curriculum design, organization of the educational system at all levels, and teaching-learning. Prerequisite: Educational Policy Studies 301 and 1 unit of epistemology (for example, Philosophy 329, 330, or 371), or equivalent; consent of instructor. 1 unit.
409. **Values and Education.** Study of the nature of value as it relates to problems of formulating and justifying educational aims and policies, curriculum design, organization of the educational system at all levels, and teaching-learning. Prerequisite: Educational Policy Studies 301 and 1 unit of ethics or value theory, or equivalent; consent of instructor. 1 unit.
410. **Seminar in Theories of Educational and Social Change.** Designed to help prospective educational leaders acquire an understanding of current theories of social change as these relate to educational institutions. There is now an extensive body of knowledge on the nature and control of social change. This needs to be made available to all prospective educational leaders in order that they may go about their duties with greater understanding and skill. Designed to aid students in bringing this knowledge to bear upon the problems of leadership in educational and social change. Prerequisite: Educational Policy Studies 304 or equivalent. 1 unit.
411. **Philosophy of Educational Research.** Examination of some crucial assumptions and concepts of contemporary research in education from the point of view both of the consumer and the practitioner of educational research. Prerequisite: A course in philosophy of education and a course in the quantitative treatment of educational data, or equivalent, or consent of instructor. 1 unit.
412. **Seminar: Dewey's Philosophy of Education.** Critical study of John Dewey's philosophy of education involving intensive study of original works. Prerequisite: Educational Policy Studies 301 or equivalent; consent of instructor. 1 unit.
413. **Seminar in Educational Concepts.** Some significant concepts, such as equality, authority, freedom, neutrality, indoctrination, objectivity, and teaching, are selected and examined in depth. Prerequisite: Educational Policy Studies 301 or equivalent; consent of instructor. 1 unit. May be repeated.
449. **Independent Study.** Offers opportunity and challenge of self-directive, independent study, that is, develops the individual's ability as an independent student and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department chairman prior to enrollment. 1/2 or 1 unit. No more than 2 units may be offered toward an advanced degree except by consent of the Dean of the College of Education.
483. **Methods in Comparative Education.** Designed to develop skills and understanding for field work related to the cross-national and cross-cultural study of education. Prerequisite: Consent of instructor. 1 unit.

- 484. Education in the Industrialized Nations.** Examination of the social, political, and economic functions of educational systems in industrialized countries with emphasis upon the development of educational policy; focus on Western Europe and North America. Prerequisite: Consent of instructor. 1 unit.
- 485. Education in the Developing Countries.** Analysis of the role and functions of education in social, political, and economic development, with particular reference to the new and the developing countries. Prerequisite: Consent of instructor. 1 unit.
- 490. Seminar for Advanced Students of Education.** Seminar in educational policy studies; sections offered in the following fields: (a) history of education; (b) philosophy of education; (c) comparative education; (d) social foundations of education; (e) philosophy of educational research; and (f) historical methods in education. Prerequisite: Consent of instructor. 1 unit. May be repeated.
- 491. Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems; students are expected to present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze all presentations critically. Limited to students who have been admitted for doctoral study. 1 to 2 units.
- 499. Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units

EDUCATIONAL PRACTICE

Offices for Student Teaching: Secondary Education, 398 Education Building; Elementary Education, 306 Education Building; Special Education, 288 Education Building; Vocational and Technical Education, 347 Education Building; Art Education, 121 Art and Design Building; Dance Education, 4-305 Krannert Center for the Performing Arts; Health and Safety Education, 113 Huff Gymnasium; Music Education, 3004 Music Building; Physical Education, 111 Huff Gymnasium; Speech and Hearing Science, 901 South Sixth Street; and Foreign Language, G-70-D Foreign Language Building.

Students entering teacher education curricula with 55 or more semester hours should apply for student teaching assignments during the first semester in the curriculum. However, such students must complete at least a semester before they may be admitted to educational practice.

- 150. School and Community Experiences.** Early field experiences in teacher education, including observation and laboratory experiences in public schools: designed to provide opportunities for career exploration, professional orientation, the development of insight into the interrelationship of theory and practice, and the place of the student in the educational process. Prerequisite: Consent of instructor. 0 to 4 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 220. Educational Practice in the Education of Exceptional Children.** A course in practice teaching which provides teaching experience with exceptional children. Prerequisite: Senior standing; consent of department; sufficient hours of background courses. 2 to 8 hours.
- 232. Educational Practice in Elementary Education.** A course in practice teaching to meet certification requirements for teaching in the elementary school. Prerequisite: Elementary and Early Childhood Education 233, 234, or 237 as required by the student's curriculum; senior standing. 2 to 8 hours.
- 238. Educational Practice for Special Fields in Elementary Schools.** A course in student teaching to meet requirements for certification in special fields at the elementary school level. Prerequisite: For students in the early childhood education curriculum, Elementary and Early Childhood Education 334 required; consent of instructor. 3 to 8 hours.

- 242. Educational Practice in Secondary Education.** A course in practice teaching to meet certification requirements for teaching in the secondary school. Prerequisite: Satisfactory progress in an approved teacher education program. 2 to 8 hours

EDUCATIONAL PSYCHOLOGY

Chairperson of Department: Professor R. L. Linn

Department Office: 210 Education Building, 1310 South Sixth, Champaign

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 211. Educational Psychology.** Basic undergraduate course in psychology of education for prospective teachers; materials and principles from the various areas of psychology (mental hygiene, psychology of learning, etc.) applied to the practical problems of teaching. Includes limited voluntary participation as a subject in experiments. Prerequisite: Psychology 100. 3 hours.
- 236. Child Development for Elementary Teachers.** Study of child growth and development designed particularly for those preparing to teach in the elementary school; special emphasis on the significance of the developmental process for educational programs and procedures; and systematic experience in studying and evaluating children's behavior and in handling children. Includes limited voluntary participation as a subject in experiments. Prerequisite: Psychology 100. 3 hours.
- 241. Sex Role Socialization: Implications for Schooling.** Reviews research and practice related to sex role socialization in education; examines sex differences in academic achievement and motivation and the effect of differential classroom environments on males and females. 3 hours.
- 249. Independent Study.** Study of problems not considered in other courses; designed for students who excel in self-direction and intellectual curiosity. Prerequisite: Upperclass status; upper 5 percent of class in grade-point average; demonstrated writing competence, research potential, scholarly attitude, and interest as attested to by instructor; consent of adviser and staff member who supervises the work. 1 to 4 hours.
- 250. Career Development Theory and Practice.** The design and implementation of an innovative life planning process; a participatory experience that includes a survey of theories, models, and research on life planning and that encourages systematic skill identification, values clarification, and the development of job search strategies. 3 hours.
- 291. Thesis.** Prerequisite: Senior standing. 2 hours.
- 292. Thesis.** Prerequisite: Senior standing. 2 hours.
- 311. Psychology of Learning for Teachers.** A study of the psychology of human learning as it applies to instruction, educational issues, and educational problems. Prerequisite: Educational Psychology 211 or equivalent. 3 hours, or 1/2 or 1 unit.
- 312. Mental Hygiene and the School.** Examination of social and emotional adjustment; study of normal personality, integration, feelings of inferiority, adjustment mechanisms, classroom therapy, and behavior disorders in children; and introduction to methods of child study and provision for emotionally disturbed children. Prerequisite: Educational Psychology 211; practice teaching or teaching experience. 2 hours or 1/2 unit.
- 313. Child Language and Education.** Provides an overview of current knowledge about children's acquisition of communicative competence together with a consideration of the educational import of this developmental process. Prerequisite: Educational Psychology 211 or 236; or equivalent. 3 hours, or 1/2 or 1 unit.
- 314. Sociocultural Influences on Learning.** Provides a general overview of the relationship of language, culture, and society to the teaching-learning process; gives broad exposure to research and theory concerned with the effects of sociocultural factors on cognition, perception, and motivation; also considers the effect of such

- factors on classroom interaction. Prerequisite: Educational Psychology 211 or 236; or equivalent. 3 hours, or 1/2 or 1 unit.
315. **Personality and Social Development.** Same as Psychology 365. See Psychology 365.
316. **Discipline and Classroom Management.** A general overview of theories related to analyzing student behaviors in the classroom; the incidence and etiology of conduct problems and behavior disorders in the classroom, with emphasis upon preventive strategies and guiding principles for maintaining classroom discipline. Prerequisite: Educational Psychology 211 or 236, or equivalent. 3 hours or 1/2 or 1 unit.
341. **Applications of Sex Role Theory to Counseling.** Reviews research on sex role socialization related to career, family, and personal roles for both sexes; discusses counseling strategies aimed at freeing persons from attitudes and behaviors that limit their freedom to choose; and reviews strategies for change at policy, agency and individual levels. 4 hours or 1 unit.
343. **Individual Intelligence Testing.** Fundamental concepts relevant to the general problem of the individual testing of learning aptitude; acquisition of psychometric competence in the use of the 1960 Binet and the Wechsler tests; and acquaintance and limited practice in the administration, scoring, and interpretation of results obtained by performance scales and other devices appropriate for use with individuals having sensory, associative, and/or motor impairments. Prerequisite: Consent of instructor and 6 hours of psychology and Special Education 324, or Educational Psychology 392 or Psychology 390. 3 hours or 1 unit.
359. **Professional Skill Development Workshop in Educational Psychology.** Laboratory, pre-practice, or workshops designed to teach practitioner-oriented skills in specialized areas of educational psychology; requests for initiation of sections in this course may be made by students or by faculty members. Prerequisite: Junior standing. 2 to 4 hours, or 1/2 to 1 unit. May be repeated to a maximum of 8 hours or 2 units.
360. **Educational Uses of Television and Radio.** Same as Radio and Television 360. See Radio and Television 360.
362. **Adult Learning and Development.** Same as Administration, Higher, and Continuing Education 362. See Administration, Higher, and Continuing Education 362.
363. **Instructional Design.** Same as Administration, Higher, and Continuing Education 363. The design, systematic development, and evaluation of instructional programs, including delineation of performance outcomes, analysis of concepts, design of instructional sequences, assessment of student performance, and survey of current research. Each student develops an instructional program. Prerequisite: A foundation course in educational psychology or psychology. 4 hours or 1 unit.
364. **Psychological and Social Distortion of Information.** Study of how information is psychologically and socially constructed and distorted; implications for consumerism, political involvement, media monitoring, problem solving, policy making, and education. Prerequisite: Psychology 100. 3 hours or 1 unit.
385. **Anthropology of Education.** Same as Anthropology and Educational Policy Studies 385. See Educational Policy Studies 385.
387. **Computer Use in Education.** Overview of the nature and development of automation in education; use of electronic data processing systems for administrative purposes, for instruction, and for research; discussion of problems of computer management, natural language analysis, and simulation CAI applications; and laboratory experience with on-line terminals, remote entry devices, and peripheral equipment. Prerequisite: Educational Psychology 390 or equivalent, or consent of instructor. 3 hours or 1 unit.
390. **Elements of Educational Statistics.** Designed for terminal value for professional training of students not intending to pursue advanced graduate work, and for introductory value for students continuing graduate study in education; descriptive statistics, introduction to correlation and regression, the normal curve, statistical

- inference, and the presentation and interpretation of statistical data in educational literature. Prerequisite: Junior standing. 3 hours or 1 unit.
- 391. Construction and Use of Tests in Teaching.** The relationship of classroom testing to educational objectives and the curriculum; the construction, administration, and scoring of the various types of essay and short-answer tests; and other means of measuring the attainment of objectives and marking procedure. Designed primarily for classroom teachers. Prerequisite: Educational Psychology 211 or 236. 4 hours or 1 unit.
- 392. Introduction to the Principles of Measurement.** Study of the selection, preparation, administration, and interpretation of psychological and educational tests and diagnostic devices; emphasis on theory at a beginning level, with application to hypothetical school situations as a teaching device; and consideration of the sources of standard tests, criteria for their evaluation, methods of scoring, interpretation, and general and special areas. Prerequisite: Educational Psychology 211 or 236. 4 hours or 1 unit.
- 399. Issues and Developments in Educational Psychology.** Experimentation or seminar on topics not treated by regularly scheduled courses. Requests for initiation of the course may be made by students or by faculty members. 2 or 4 hours, or 1/2 or 1 unit. May be repeated to a maximum of 8 hours or 2 units.
- 411. Psychology of Adolescence for Teachers.** Psychological significance of adolescence, its biological and social foundations, and its implications for education. Prerequisite: Educational Psychology 311 and 312. 1 unit.
- 412. Advanced Child Development for Students of Education.** Considers the nature of the child and the child's development during the preschool and elementary school years; emphasis on development as a process of social learning; interpretation of the scientific literature as it concerns the educative process; and discussion of methods of studying and evaluating the behavior of the child as an individual and in group situations. Prerequisite: Educational Psychology 311 and 312. 1 unit.
- 413. Social Psychology and the Problems of Education.** Consideration of the concepts and methods of social psychology as applied to the professional functions of teachers, administrators, and other persons engaged in education; opportunity to work upon field problems. Prerequisite: Educational Psychology 311, 312, and 390. 1 unit.
- 414. The Psychology of College Teaching.** Designed particularly for graduate students minoring in education or preparing for college teaching. Psychoeducational problems in undergraduate and graduate teaching; special emphasis upon individual differences, remedial procedures, principles of learning, the technology of teaching and learning, adjustment problems of college students, counseling and advisory services, test construction, and analysis and use of test results and resource materials. Prerequisite: A course in psychology; consent of instructor. 1 unit.
- 415. Psychological Theories Applied to Education.** An advanced course in human behavior; special attention given to contemporary systems of psychology and their relationship to educational practice. Prerequisite: Educational Psychology 311 and 312; Educational Psychology 411 or 412; candidacy for Ed.D. or Ph.D. in Education. 1 unit.
- 422. Basic Principles of Counseling.** Study of counseling processes that are especially applicable to the problems of normal individuals; study of the theories of education and personality which underlie counseling procedures for the purpose of developing the student's ability to evaluate these procedures. Prerequisite: Educational Psychology 311 and 312. 1 unit.
- 423. The Use of Tests in Guidance.** Practice in interpreting test results in case studies; study of the implications on test choices and usage of the philosophic orientation of the counselor, the type of case, the case setting, and the case information available; and discussion of the advantages and disadvantages of particular tests for given types of cases. Prerequisite: Educational Psychology 390, 392, and 422, or equivalent. 1 unit.
- 424. Supervised Practice in Educational Psychology.** Intensive supervised experiences in applied educational psychology; use of a wide variety of diagnostic and

observational techniques and treatment. Students may take more than one section. Prerequisite: Master's degree in educational psychology or equivalent; consent of instructor. 1 to 2 units.

- 425. Principles and Practices of Student Personnel Services.** For teachers, administrators, student advisers, and others who are interested in basic guidance principles and in guidance methods useful to schools and to agencies dealing with out-of-school youth and adults; consideration of the role of guidance specialists and the guidance functions of community agencies. 1 unit.
- 427. Principles and Techniques of Group Guidance.** Study of the principles of group guidance and their application; review of the historical development of group guidance and the study of pertinent research. Discussion and role playing have an important part in the work of the course, and case materials are utilized. Prerequisite: Educational Psychology 311, 312, 422, 423, and 425; or consent of instructor. 1 unit.
- 428. Theories of Career Development and the Use of Occupational Information.** Results of recent occupational research and use of these results by teachers and counselors; attention given to research techniques suitable for use in local occupational studies. Prerequisite: Educational Psychology 425 or an introductory course in counseling. 1 unit.
- 429. Field Instruction in Educational Psychology.** Individual instruction designed to help the advanced student apply basic principles of education or psychology in institutional settings. Each student is assigned to a school, community agency, or other applied settings for a supervised field experience in some aspect of educational psychology. Prerequisite: Master's degree in educational psychology or equivalent, and consent of instructor. 1 to 4 units. May be repeated to a maximum of 4 units; no more than 2 units may be taken in any given semester.
- 440. Social Development.** Research and theory relating to the social development of children; special attention to processes of social learning, environmental influences on social behavior, and the role of education in facilitating the development of social skills; and emphasis on experimental research conducted in naturalistic settings. Prerequisite: Educational Psychology 236 or Psychology 216, or equivalent; and Educational Psychology 390, Psychology 235, or equivalent. 1 unit.
- 445. Motivation and Achievement.** Examines the social, cultural, and psychological antecedents of achievement behavior; reviews current theories of achievement motivation, research, issues, and methodologies; and emphasizes applications to such areas as education, sport, and work. Gives special attention to age-related changes in motivation and achievement patterns. Prerequisite: Educational Psychology 390 or equivalent; Psychology 373 is recommended. 1 unit.
- 446. Research Methods in Human Development.** Introduction to methods and the design of research appropriate to the study of child and adult development; consideration of cross-disciplinary approaches, observational and experimental methods, methods for the assessment of social change, and the study of intergenerational differences in behavior. Prerequisite: Educational Psychology 496 or equivalent; 4 units of graduate work in education or the social or behavioral sciences. 1 unit.
- 447. Seminar in Rehabilitation Counseling.** Problems of rehabilitation, including problems associated with specific physical and mental disabilities; critical examination of literature pertaining to rehabilitation, with emphasis on recent publications. Prerequisite: Educational Psychology 422. 1/2 unit. May be repeated to a maximum of 1 unit.
- 449. Independent Study.** Offers opportunity and challenge of self-directive, independent study; develops the individual's ability as an independent student; and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department chairperson prior to enrollment. 1/2 or 1 unit. No more than 2 units may be offered toward an advanced degree except by consent of the Dean of the College of Education.

- 451. Evaluation of Educational Programs.** Same as Elementary and Early Childhood Education 451. See Elementary and Early Childhood Education 451.
- 460. Field Research in Educational Settings.** Examination of the conduct of research in educational settings with a focus on researcher-practitioner research collaboration; considers social psychological and design aspects of field research. Students engage in research in cooperation with local schools. Prerequisite: Educational Psychology 390 or equivalent, and consent of instructor. 1 unit.
- 461. School-University Research Practicum.** Focuses on developing skills in field-initiated research; includes research methods, implementation and evaluation of new education programs, and school district policy and operation. Students do a project designed to meet specific school needs under the direction of practicum advisers. Prerequisite: Educational Psychology 460; and Educational Psychology 496 or Psychology 306, or equivalent; or consent of instructor. 1 unit.
- 483. Single Subject Research Design.** Same as Special Education 483. See Special Education 483.
- 485. Multivariate Correlational Techniques in Educational Research.** Same as Psychology 486. Emphasis on educational research applications of correlational techniques; special attention to issues in principles of research design underlying appropriate uses of such techniques as multiple, partial, and part (semipartial) correlation and factor analysis; and illustration of techniques by examples drawn from published studies and projects conducted on this campus. Emphasis will be placed on application and interpretation of techniques rather than on theoretical rationales. Prerequisite: Educational Psychology 496 or equivalent; consent of instructor. 1 unit.
- 487. Classroom Transactions and Student Outcomes.** An advanced course in the investigations of relationships between classroom transactions and student outcomes; major topics include the methodology of observing and measuring classroom events, review of correlational and experimental research in classroom settings, and the design of future research in this area. Prerequisite: Educational Psychology 496 or consent of instructor; background work in educational theory assumed. 1 unit.
- 490. Seminar for Advanced Students of Education.** Seminar in educational psychology; topics relate to the areas of specialization represented by the various divisions within the department. Prerequisite: Admission for doctoral study or consent of instructor. 0 to 1 unit. May be repeated to a maximum of 2 units in any area of specialization.
- 491. Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems. Students are expected to present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze critically all presentations. Limited to students who have been admitted for doctoral study. 1 to 2 units.
- 492. Psychology of Learning and Instruction.** Same as Psychology 492. An advanced course in the nature and conditions of long-term cognitive learning and retention in classroom and similar situations; intended for doctoral students with a special interest in research leading to the improvement of classroom teaching and learning, in psychological aspects of curriculum research, and in the cognitive aspects of military and industrial training. Prerequisite: Consent of instructor. 1 unit.
- 494. Multivariate Analysis in Psychology and Education.** Same as Psychology 494 and Sociology 494. See Psychology 494.
- 495. Theories of Measurement.** Same as Psychology 495. Classical test theory (true score, error of measurement, reliability and validity of test scores, composite measures); proposed alternatives to the classical model (generalizability theory, matrix sampling, latent trait theory, criterion-referenced measurement). Prerequisite: Educational Psychology 496 or Psychology 307, or equivalent; Educational Psychology 392 or Psychology 390, or equivalent. 1 unit.
- 496. Statistical Methods in Education.** Introduction to inferential statistical methods in education; includes probability theory, distribution theory, interval estimation,

hypothesis testing, regression and correlational analysis, and analysis of variance. Prerequisite: Educational Psychology 390 or equivalent. 1 unit.

497. **Advanced Statistical Methods in Education.** Advanced topics in analyses of variance and covariance, and principles of experimental design; brief introduction to multivariate analysis, including rudiments of matrix algebra. Prerequisite: Educational Psychology 496, Psychology 307, or equivalent. 1 unit.
498. **Theories of Educational Evaluation.** Study of the process of educational program evaluation, its purpose and procedures, with emphasis on settings, personnel, and performance; review of principal theories; and study of models, histories, political contexts, ethics, and epistemology of evidence as they relate to the observation, judging, and reporting of educational programs. Prerequisite: Educational Psychology 390 and 392, or consent of instructor. 1 unit.
499. **Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units

ELECTRICAL ENGINEERING

Head of Department: Professor G. W. Swenson, Jr.

Department Office: 155 Electrical Engineering Building, 1406 West Green, Urbana

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Seminar.** Discussions of educational programs, career opportunities, and other topics in electrical engineering. For electrical engineering students. 0 hours.
220. **Basic Electric Circuit Analysis.** Fundamentals of electric circuit analysis including network theorems, transient, sinusoidal steady-state, and three-phase circuits. Credit is not given for both Electrical Engineering 220 and 260. Prerequisite: Physics 107; Mathematics 240, 241, or 245. 3 hours. Electrical Engineering students receive no credit.
229. **Introduction to Electromagnetic Fields.** Elementary electromagnetic field theory as summarized in Maxwell's equations in integral and differential form; wave propagation; and energy and power in electromagnetic fields. Prerequisite: Physics 107; Mathematics 345. 3 hours.
244. **Electrical Engineering Laboratory, I.** Introduction to electronic instruments, basic measurement techniques, and basic electronic components; preparation for experimental projects. Prerequisite: Credit or concurrent registration in Electrical Engineering 260. 2 hours.
245. **Electrical Engineering Laboratory, II.** Laboratory projects in various areas of electrical engineering. Prerequisite: Electrical Engineering 244; credit or concurrent registration in Electrical Engineering 342 or consent of instructor. 2 hours.
246. **Project Laboratory.** Planning, designing, executing, and evaluating various experimental projects by the student along with discussion of the actual examples of experimental design, error control, and data processing. Prerequisite: Senior standing in electrical engineering; consent of instructor. 2 to 4 hours.
249. **Digital Systems Laboratory.** Introduction to the experimental analysis and synthesis of digital networks. Prerequisite: Electrical Engineering 244 and 290, or consent of instructor. 2 hours. Students may not receive credit for both Electrical Engineering 249 and Computer Science 265.
250. **Laboratory Applications of Microcomputers.** Introduction to microcomputer function and use at the board level; hardware and software design for interfacing; control, data-logging, and signal-conditioning applications; and peripherals and expansion. Laboratory assignments accompany the lectures and an individual project is completed at the end of the course. Prerequisite: Electrical Engineering 290 or equivalent. 4 hours. Credit is not given for both Electrical Engineering 250 and 291.
260. **Introduction to Circuit Analysis.** Elementary signals; basic principles of network analysis; and sinusoidal steady-state analysis. Credit is not given for both Electrical

- Engineering 260 and 220. Prerequisite: Physics 107 and credit or registration in Mathematics 345 and Computer Science 101 or 121. 3 hours.
- 261. Introduction to Instrumentation, Measurement, and Control Fundamentals.** Same as Mechanical Engineering 261. See Mechanical Engineering 261.
- 271. Electrical Engineering Special Topics.** Prerequisite: As specified by department or instructor. 0 to 4 hours.
- 272. Electrical Engineering Problems.** Prerequisite: Approved written application to department as specified by department or instructor. 0 to 4 hours.
- 288. Economic Aspects of Engineering.** Fundamental principles of engineering economy. Prerequisite: Junior standing in engineering or consent of instructor. 3 hours. Students may not receive credit for both Electrical Engineering 288 and General Engineering 288.
- 290. Introduction to Computer Engineering.** Introduction to information processing with digital circuit structures; includes analog versus digital encodings, switching circuit analysis and design techniques, and introduction to wired and stored program systems. Prerequisite: Computer Science 101 or 121. 3 hours.
- 291. On-Line Computing.** On-line computer use; includes assembly language programming, I/O processes and devices, interrupts and priority, semaphores, real-time operations, multi-tasking, data acquisition, and computer-based control and communication. Prerequisite: Electrical Engineering 290, Computer Science 264, or consent of instructor. 3 hours.
- 296. Honors Project.** A special project or reading course for James Scholars in engineering. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
- 297. Honors Seminar.** Special lecture sequences and/or discussion groups arranged each semester to bring James Scholars in engineering into direct contact with the various aspects of engineering practices and philosophy. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
- 299. Thesis.** Preliminary reading and investigation. 0 to 3 hours.
- 302. Electronic Music Synthesis.** Survey of methods of electronic music production; musical notation translated into engineering terms; analysis and synthesis of sound spectra; electronic circuits for synthesis of musical sounds; and digital computer sound synthesis. Prerequisite: Music 100 or equivalent, Electrical Engineering 290 and 342. 3 hours or 3/4 unit.
- 303. Topics in Audio Engineering.** Sound perception related to audio; review of wave phenomena; acoustics of rooms and auditoriums; characteristics of microphones and loudspeakers; magnetic recording; and topics of specialized interest. Prerequisite: Electrical Engineering 260 and 373, or consent of instructor. 3 hours or 3/4 unit.
- 309. Circuit, Signal, and System Analysis.** Network modeling; Laplace transform; network functions; frequency response plots; input-output stability; state space methods; Fourier series; and Fourier integral. Prerequisite: Electrical Engineering 220 or 260, or equivalent. 4 hours or 1 unit. May not be taken for credit by graduate students in electrical engineering.
- 311. Microcomputer Laboratory.** Design, construction, and use of a small general purpose computer with a micro-processor CPU; MSI and LSI circuits used extensively; control panel, peripheral controllers, control logic, central processor, and programming experiments; and open lab format. Prerequisite: Electrical Engineering 290, Mathematics 391, or Computer Science 264; Computer Science 221; and Electrical Engineering 249 or Computer Science 265. Credit or registration in Electrical Engineering 312 is recommended. 2 hours or 1/2 unit.
- 312. Computer Organization and Design.** Basic computer organization, design constraints for digital circuits, arithmetic algorithms and hardware implementation, memory devices and system organization, control logic and microprogramming, and input-output devices and intrasystem communication. Prerequisite: Electrical Engineering 290, Mathematics 391, or Computer Science 264; and Computer Science 221. 3 hours, or 3/4 or 1 unit.

313. **Probabilistic Methods of Signal and System Analysis.** Introduction to probabilistic methods, analysis of random signals and noise, and applications to electrical engineering problems, including reliability of circuits and systems and effects of noise systems. Prerequisite: Electrical Engineering 309. 3 hours or 3/4 unit. Electrical Engineering majors may not receive graduate credit.
314. **Biomedical Instrumentation.** Same as Bioengineering 314. Introduction to engineering aspects of the detection, acquisition, processing, and display of signals from living systems; biomedical transducers for measurements of biopotentials, ions and gases in aqueous solution, force, displacement, blood pressure, blood flow, heart sounds, respiration, and temperature; and therapeutic and prosthetic devices. Prerequisite: Electrical Engineering 260 and 244, or consent of instructor. 3 hours or 3/4 unit.
315. **Biomedical Instrumentation Laboratory.** Same as Bioengineering 315. Laboratory to accompany Electrical Engineering/Bioengineering 314. Studies medical instrumentation and transducers for static and dynamic nonbiological inputs and measures actual biomedical signals; requires some animal experiments. Prerequisite: Credit or concurrent registration in Electrical Engineering 314. 2 hours or 1/2 unit.
319. **Applied Modern Algebra.** Same as Mathematics 319. See Mathematics 319.
320. **Computational Methods for Circuit Analysis.** Matrix algebra; LU decomposition; formulation of network equations; AC analysis; sensitivity; adjoint network; feedback and stability; algorithms for pole-zero determination; DC analysis of electronic circuits; transient analysis; tolerance analysis; and optimization of circuits. Prerequisite: Electrical Engineering 309 and 342. 3 hours or 3/4 unit.
321. **Introduction to Controlled Theronuclear Fusion.** Same as Nuclear Engineering 321. See Nuclear Engineering 321.
324. **Analog Filter Design.** Properties of passive network functions; synthesis of RC and LC passive network functions; operational amplifier; RC active circuit synthesis; sensitivity of networks; approximation theory; and practical filter design. Prerequisite: Electrical Engineering 309. 3 hours or 3/4 unit.
325. **Introduction to the VLSI System Design.** Same as Computer Science 335. Introduction to the design and layout of VLSI (very large scale integrated) chips for complex digital systems using integrated circuit cells as building blocks and employing hierarchical design methods; novel architectures are designed and implemented, using given technology and design rules on a mini-computer system in the lab. Prerequisite: Electrical Engineering 249 and 312 or equivalent. 3 hours or 3/4 unit.
330. **Electromechanics.** Quasi-static electromagnetic fields; lumped-parameter electromechanics; rotating machines; dynamics of electromechanical systems; and fields and moving media. Prerequisite: Electrical Engineering 229 and 260. 3 hours or 3/4 unit.
332. **Induction Motors and DC Machines.** The fundamentals and applications of single- and three-phase induction motors and DC machines. Prerequisite: Senior standing. 3 hours or 3/4 unit.
335. **Electrical Machinery Laboratory.** A study of the performance characteristics of transformers and AC and DC rotating machines by laboratory methods. Prerequisite: Credit or concurrent registration in Electrical Engineering 332 or 336. 2 hours or 1/2 unit.
336. **Transformers and Synchronous Machines.** Transformers, polyphase transformer connections, synchronous generators, synchronous motors, and parallel operation of synchronous machines. Prerequisite: Senior standing. 3 hours or 3/4 unit.
337. **Control Structure of Computers.** Same as Computer Science 337. See Computer Science 337.
338. **Communication Networks for Computers.** Same as Computer Science 338. See Computer Science 338.
339. **Computer Aided Design for Digital Systems.** Same as Computer Science 339. See Computer Science 339.

- 340. Solid State Electronic Devices.** Semiconductor materials and their electronic properties and applications to electronic devices; p-n junctions, transistors, and other diode and triode devices; and low-frequency applications of diodes. Prerequisite: Physics 108; Mathematics 345. 3 hours or 3/4 unit.
- 342. Electronic Circuits.** Linear and nonlinear amplification; modulation and demodulation concepts; and introduction to feedback amplifiers and oscillators. Prerequisite: Credit or concurrent registration in Electrical Engineering 244 and 309. 3 hours or 3/4 unit.
- 344. Theory and Fabrication of Solid State Devices.** Laboratory and lecture course on the physical theory, design, and fabrication of solid state devices; includes the electronic properties of semiconductors (such as mobility, carrier concentration, lifetime, energy gap), and techniques for fabricating (oxidation, diffusion, oxide masking, alloying) p-n junction devices. Prerequisite: Electrical Engineering 340. 4 hours or 1 unit.
- 345. Bipolar Transistor Engineering.** A detailed analysis of bipolar transistor behavior which leads to equations for current gain and gain-bandwidth product; current and voltage dependence as well as effects of high-level injection, current crowding, and graded base profiles; and development of a design procedure which relates device to processing parameters. Prerequisite: Credit or registration in Electrical Engineering 344 or equivalent. 3 hours or 3/4 unit.
- 346. Hybrid Circuit Fabrication Laboratory.** Laboratory course on the basics of fabricating thin- and thick-film components as used in hybrid electronic circuits; experiments covering vacuum deposition, sputtering, anodization, resist processes, screen preparation, screen printing, and firing and trimming. Lectures provide background material and cover trade-offs of the two technologies. Prerequisite: Electrical Engineering 344. 2 hours or 1/2 unit.
- 347. High-Frequency Circuit Design Using Scattering Parameters.** Laboratory and lecture on the use of scattering parameters for the design of high-frequency amplifiers. Prerequisite: Electrical Engineering 353. 2 hours or 1/2 unit.
- 348. Introduction to Artificial Intelligence.** Same as Computer Science 348. An introductory description of the major subjects and directions of research in artificial intelligence; topics include AI languages (LISP and PROLOG), basic problem solving techniques, knowledge representation and computer inference, machine learning, natural language understanding, computer vision, robotics, and societal impacts. Prerequisite: Electrical Engineering 291, Computer Science 221, or consent of instructor. 3 hours or 3/4 or 1 unit.
- 350. Lines, Fields, and Waves.** Wave equation, free and guided wave propagation, waveguides, and radiation. Prerequisite: Electrical Engineering 229 and 260. 3 hours or 3/4 unit.
- 351. Microwave Laboratory.** Laboratory analysis at UHF and microwave frequencies. Prerequisite: Electrical Engineering 350. 2 hours, or 0 to 1/2 unit.
- 352. Electromagnetic Fields.** Plane waves at oblique incidence, wave polarization, anisotropic media, radiation, space communications, and waveguides. Prerequisite: Electrical Engineering 350. 3 hours or 3/4 unit.
- 353. Radio Communication Circuits.** Design of a radio system for transmission of information; types of receivers, matching techniques, receiver and antenna noise, types of modulation, high-frequency circuitry, and point-to-point and satellite communications. Prerequisite: Electrical Engineering 309 and 342; credit or concurrent registration in Electrical Engineering 350. 4 hours or 1 unit.
- 354. Antennas.** Antenna parameters; polarization of electromagnetic waves; basic antenna types; antenna arrays; broadband antenna design; and antenna measurements. Prerequisite: Electrical Engineering 350 or Physics 342, or consent of instructor. 3 hours or 3/4 unit.
- 355. Optical Electronics.** Optical beams and cavities; semiclassical theory of gain; characteristics of typical lasers; and application of optical devices. Prerequisite: Electrical Engineering 350 or Physics 342, or consent of instructor. 3 hours or 1 unit.

356. **Applied Electrostatics.** Discusses commercial and industrial applications of electrostatics, emphasizing general physical laws which govern their behavior; selects examples from a variety of areas, including computer peripherals, copying equipment, electric power transmission, biomedical instrumentation, and smoke detectors. Prerequisite: Electrical Engineering 229 or equivalent, and senior standing. 3 hours, or 3/4 or 1 unit.
358. **Applications of Radio Wave Propagation.** Terrestrial atmosphere, radio wave propagation, and applications to radio sensing and radio communication. Prerequisite: Electrical Engineering 350 or consent of instructor. 3 hours or 3/4 unit.
359. **Analog and Pulse Communication Systems.** Introduction to amplitude, phase, frequency, and pulse code modulation systems; discusses bandwidth requirements, effects of noise and applications in commercial broadcast, and telephone and satellite communications. Prerequisite: Credit or registration in Electrical Engineering 313 or equivalent. 3 hours or 3/4 unit.
360. **Coherent Optics Laboratory.** Introduction to the properties and applications of coherent laser light; experiments in interferometry, optical processors and spatial filtering, holography, optical communications, fiber optics, and special projects. Prerequisite: Credit or registration in Electrical Engineering 309 and 350, or credit in Physics 371, or equivalent. 3 hours or 3/4 unit.
361. **Introduction to Digital Communication Systems.** Introduction to signals and noise in digital communication systems; analysis and design of efficient digital communication receivers; and signal design for, and performance of, practical communication systems. Prerequisite: Electrical Engineering 313 or equivalent. 3 hours or 3/4 unit.
364. **Introduction to Computer Arithmetic.** Same as Computer Science 364. See Computer Science 364.
366. **Introduction to Surface Acoustic Waves.** Basic ultrasonic principles; piezoelectricity; transducer equivalent circuits; and radar and communication system applications: delay lines, bandpass filters, oscillators, synthesizers, matched filters, convolvers, and Fourier transformers. Prerequisite: Electrical Engineering 309 and 350, or consent of instructor. 3 hours or 3/4 unit.
367. **Active Networks.** Study of active device models and their application to electrical network equation forms; expression of systems in terms of their network functions; examination of the characteristics of feedback systems in particular; and examination of sensitivity and stability factors. Prerequisite: Electrical Engineering 342. 3 hours or 3/4 unit.
368. **Solid-State Motor Drive Systems.** General principles of solid-state motor drives using silicon-controlled rectifiers and integrated circuits; discussion of drive systems and components including inverters, frequency converters, motors, generators, and control systems; and industrial applications. Prerequisite: Electrical Engineering 330 and 342. 3 hours or 3/4 unit.
369. **Semiconductor Device and Linear IC Applications Laboratory.** Laboratory study of applications of unijunction transistors, silicon-controlled rectifiers, triacs, field effect transistors, and linear integrated circuits such as differential amplifiers, operational amplifiers, and linear communications integrated circuits. One hour of lecture and a three-hour laboratory each week. Prerequisite: Electrical Engineering 342. 2 hours or 1/2 unit.
371. **Topics in Electrical Engineering.** Lectures and discussions relating to new areas of interest. Prerequisite: Specified by department or instructor. 0 to 4 hours, or 0 to 1 unit. May be repeated.
373. **Fundamentals of Engineering Acoustics.** Same as Theoretical and Applied Mechanics 373. Development of the basic theoretical concepts of acoustical systems; mechanical vibration, plane and spherical wave phenomena in fluid media, lumped and distributed resonant systems, and absorption phenomena and hearing. Prerequisite: Mathematics 345 or equivalent. 3 hours, or 3/4 or 1 unit.
374. **Ultrasonic Techniques.** Ultrasonic wave propagation, generation, detection, and measurement in liquid and solid media, acoustic impedance concepts, ultrasonic

- absorption and velocity measurement techniques, piezoelectricity, and discussion of industrial, experimental, bioengineering, and medical applications. Prerequisite: Electrical Engineering 373 or equivalent, or consent of instructor. 3 hours, or 3/4 or 1 unit.
- 375. Modeling of Bio-Systems.** Same as Bioengineering 375. Application of linear systems theory and feedback control systems analysis to biological systems; sensory receptors, neuro-muscular system models, control of eye movement, the pupil control system, man-machine interactions, parameter identification in biological systems; and optional project laboratory. Prerequisite: General Engineering 222, Mechanical Engineering 265, or Electrical Engineering 309; or consent of instructor. 3 or 4 hours, or 3/4 or 1 unit.
- 376. Symmetrical Component Analysis of Power Systems.** Representation of power systems; symmetrical component; positive, negative, and zero sequence impedances of network components; sequence networks; unsymmetrical faults; unsymmetrical power systems; and matrix algebra in symmetrical component analysis. Prerequisite: Senior standing. 3 hours or 3/4 unit.
- 378. Steady State Power Systems.** Power system design, steady state power system analysis, computer solutions, and economic dispatch. Prerequisite: Senior standing. 3 hours or 3/4 unit.
- 379. Pulse and Digital Laboratory.** Laboratory to accompany Electrical Engineering 380. Prerequisite: Credit or concurrent registration in Electrical Engineering 380. 1 hour or 1/4 unit.
- 380. Pulse and Digital Circuits.** Analysis and design of circuits in which nonlinearities of the active devices are a significant factor or in which the signals are primarily pulses; generation, transmission, and processing of such signals appropriate for small-scale instrumentation as well as to large systems such as computers. Prerequisite: Electrical Engineering 290 and 342; credit or concurrent registration in Electrical Engineering 379, or consent of instructor. 3 hours or 3/4 unit.
- 381. Introduction to Computer Memories and I/O.** Same as Computer Science 381. See Computer Science 381.
- 382. Large Scale Integrated Circuit Design.** Bipolar and MOS field effect transistor characteristics; LSI fabrication techniques for MOS and IIL circuits; calculation of circuit parameters from the process parameters; and design of LSI circuits such as logic, memories, charge-coupled devices, and A/D and D/A converters. Prerequisite: Electrical Engineering 340 and 380, or equivalent. 3 hours or 3/4 unit.
- 383. Principles and Application of Linear Integrated Circuits.** Techniques of analysis and synthesis of linear integrated circuits, concentrating on linear integrated circuit biasing systems, building blocks, differential amplifiers, operational amplifiers, and integrated circuits used in communications; analysis of integrated circuits by hand calculations and by specialized computer analysis programs. Prerequisite: Electrical Engineering 342. 3 hours or 3/4 unit.
- 386. Control Systems, I.** Analysis and design of control systems with emphasis on modeling, state variable representation, computer solutions, modern design principles, and laboratory techniques. Prerequisite: Electrical Engineering 309 or consent of instructor. 4 hours or 1 unit.
- 387. Introduction to Quantum Electronics for Electrical Engineers.** Introduction for the senior electrical engineering student to the application of quantum mechanical concepts to electronics problems; specifically, application of elementary quantum mechanics to the detailed study of a calculable two- state laser system; and incidental quantum ideas bearing on electronics. Prerequisite: Physics 383 or consent of instructor. 3 hours or 1 unit.
- 390. Introduction to Optimization.** Basic theory and methods for the solution of optimization problems; iterative techniques for unconstrained minimization; and introductory presentation of linear and nonlinear programming with engineering applications. Prerequisite: Computer Science 101 or Mathematics 343, or consent of instructor. 3 hours or 1 unit.

391. **Switching Theory.** Same as Computer Science 391 and Mathematics 391. See Mathematics 391.
392. **Finite State Machines.** Same as Computer Science 392 and Mathematics 392. See Mathematics 392.
396. **Computer Displays and Peripherals.** Same as Computer Science 386. See Computer Science 386.
397. **Projects and Lectures in Quantum Electronics.** Study of processes involving quantum mechanical energy transfers in energized media leading to various laser devices and their applications. A series of lectures, supplementing the special projects, offers background information on spectroscopy, collisional energy transfer, laser pumping schemes, modulation at optical frequencies, holography, and other related topics. Prerequisite: Senior standing; consent of instructor; Electrical Engineering 387 recommended. 3 hours or 3/4 unit.
400. **Seminar.** Required of all graduate students. 0 credit.
412. **Computer Architecture.** Advanced concepts in computer architecture; design, management, and modeling of memory hierarchies, stack-oriented processors, associative processors, pipelined computers, and multiple processor systems; and focuses on hardware alternatives in detail and their relation to system performance/cost. Prerequisite: Electrical Engineering 312 or Computer Science 333, or consent of instructor. 1 unit.
414. **Engineering Applications of Linear Graphs.** Same as Computer Science 414. Elementary theory of linear graphs; Euler graphs; incidence, cut-set, and circuit matrices and their properties; realizability of cut-set, circuit, and tree matrices; applications to network analysis and synthesis; signal flow graphs; applications to switching circuits and automata; and communication networks. Prerequisite: Electrical Engineering 416; Mathematics 315 or 318. 1 unit.
415. **Control System Theory and Design.** Synthesis of feedback control systems to meet design specifications, including sensitivity; multivariable systems; introduction to systems with random inputs; state variable techniques; and nonlinear systems. Prerequisite: Electrical Engineering 386 or equivalent, or consent of instructor. 1 unit.
416. **Analysis of Networks and Systems.** Dynamic equations of linear lumped networks and systems; time-domain analysis and state space methods; frequency-domain analysis and transform methods; stability criteria; and applications to various problems in electrical engineering. Prerequisite: Electrical Engineering 309. 1 unit.
417. **Nonlinear and Adaptive Control.** Studies design of nonlinear control systems based on stability considerations; examines Lyapunov and hyperstability approaches to analysis and design of model reference adaptive systems; identifiers, observers, and controllers for unknown plants. Prerequisite: Electrical Engineering 415. 1 unit.
418. **Electric and Magnetic Fields.** Rigorous treatment of basic laws, static fields, typical field systems, harmonic functions, conjugate functions, and conformal transformation. 1 unit.
420. **Electromagnetic Waves and Radiating Systems.** Fundamental electromagnetic theory with applications to transmission lines, waveguides, and antennas; introduction to the solution of advanced problems in static electric and magnetic fields. Prerequisite: Electrical Engineering 352. 1 unit.
421. **Advanced Electromagnetic Engineering.** Reciprocity and equivalence principles; formulation of scattering and diffraction problems; approximations for large and for short wavelengths; plane, cylindrical, and spherical wave problems; variational methods; Wiener-Hopf techniques; and applications to antennas and waveguide problems. Prerequisite: Electrical Engineering 420. 1 unit.
422. **Controlled Fusion Systems, I.** Same as Nuclear Engineering 422. See Nuclear Engineering 422.
423. **Gaseous Electronics and Plasmas.** Basic concepts and techniques, both theoretical and experimental, which are used in the areas of gaseous electronics, gas and solid plasmas, controlled fusion, aeronomy, gas lasers, and magnetohydrodynamics.

Prerequisite: Physics 383 or Electrical Engineering 352, or equivalent, or consent of instructor. 1 unit.

425. **Nuclear-Electrical Energy Conversion.** Same as Nuclear Engineering 425. See Nuclear Engineering 425.
428. **Analysis of Nonlinear Systems.** Same as Theoretical and Applied Mechanics 428. Treatment of singular points and stability considerations; consideration of graphical and analytical methods, including the perturbation method, variation of parameters, Galerkin's method, and the Ritz method for solving nonlinear differential equations. Prerequisite: Mathematics 341; consent of instructor. 1 unit.
431. **Theory of Guided Waves.** Propagation in general cylindrical waveguides; eigenvalue problems, stationary principles, microwave circuit theorems, boundary value problems, and the determination of circuit parameters; and periodically loaded waveguides with anisotropic media. Prerequisite: Electrical Engineering 420. 1 unit.
432. **Compound Semiconductors (Optical Devices).** Properties of III-V and II-VI compound semiconductors and the devices which are unique to these materials; emphasis on materials such as GaAs, Ga(AsP), GaP, CdSe, Cd(SeS), etc., and on luminescence, semiconductor lamps, and semiconductor lasers. Prerequisite: Graduate standing in electrical engineering with some background in modern physics; elementary quantum mechanics; elementary semiconductor theory or equivalent. 1 unit.
433. **Theory of High-Speed Parallel Computation.** Same as Computer Science 433. See Computer Science 433.
434. **Random Processes.** Basic concepts of random processes; spectral analysis; linear systems with random inputs; Markov chains and Markov processes; and applications to communications and control systems engineering. Prerequisite: Mathematics 361 or equivalent, or Electrical Engineering 361. 1 unit.
435. **Theory of Semiconductors and Semiconductor Devices.** Same as Physics 435. Introductory quantum mechanics of semiconductors; energy bands; dynamics of Bloch electrons in static and high-frequency electric and magnetic fields; equilibrium statistics; transport theory, diffusion, drift and thermoelectric effects; and characteristics of p-n junctions, heterojunctions, and transistor devices. Prerequisite: Senior-level course in quantum mechanics or atomic physics. 1 unit.
437. **Principles of Microwave Measurements.** Generation and detection of the laboratory signal; the generalized impedance concept; matrix representation of waveguide discontinuities; determination of equivalent network parameters; analysis of measurement techniques by signal flow graphs; and accuracy criteria. Prerequisite: Electrical Engineering 355. 1 unit.
439. **Advanced Theory of Semiconductors and Semiconductor Devices.** Continuation of Electrical Engineering 435. Selected advanced topics of current interest in the physics of semiconductors and solid-state devices. Prerequisite: Electrical Engineering 435. 1 unit.
441. **Computer Systems Analysis.** Same as Computer Science 441. See Computer Science 441.
442. **Design of Fault-Tolerant Digital Systems.** Formal models and concepts in fault diagnosis, fault-tolerant systems, redundancy, and self-checking systems; case studies and state-of-the-art survey of fault-tolerant computing. Prerequisite: Electrical Engineering 312 and 391, or equivalent. 1 unit.
448. **Computer Models of Cognitive Processes.** Formal models and concepts in vision and language; detailed analysis of computer vision, language, and learning problems; relevant psychological results and linguistic systems; and survey of the state of the art in artificial intelligence. Prerequisite: Electrical Engineering 348. 1 unit.
451. **Digital Processing of Signals.** Sampling theorem; the fast Fourier transform and its application in the digital processing of signals; design of finite impulse response digital filters; theory and design of recursive digital filters including round-off errors and limit cycles; and surface wave filters. Prerequisite: Electrical Engineering 309 or equivalent. 1 unit.

452. **Advanced Computational Techniques for Electronic Circuit Analysis and Design.** Formulation of circuit equations; electronic device models for computer-aided analysis; sparse matrix algorithms for the solution of large systems; AC, DC, and transient analysis of electronic circuits; the adjoint technique for sensitivity and noise analysis; tolerance analysis; optimization methods in design; and analysis of communication circuits. Prerequisite: Electrical Engineering 320 and 416, or consent of instructor. 1 unit.
453. **Optimum Control Systems.** Formulation of the optimization problem; controllability; observability; stability; Lyapunov's second method; application of variational calculus, maximum principle, and principle of optimality to control problems; stochastic control; and adaptive control. Prerequisite: Electrical Engineering 415. 1 unit.
454. **Sampled-Data Control Systems.** Analysis and design of feedback control systems with digital and sampled data. Prerequisite: Electrical Engineering 415 or equivalent. 1 unit.
455. **Control of Stochastic Systems.** Stochastic control models; development of control laws by dynamic programming; separation of estimation and control; Kalman filtering; self-tuning regulators; dual controllers; decentralized control. Prerequisite: Electrical Engineering 415 and 434. 1 unit.
456. **Coding Theory.** Same as Computer Science 456 and Mathematics 476. General discussion on coding theory with emphasis on the algebraic theory of cyclic codes; error-control procedures and circuits; and applications to computers and data-transmission systems. Prerequisite: Mathematics 317 or equivalent, or consent of instructor. 1 unit.
460. **Principles of Optical Communications Systems.** Characteristics of optical communication systems; topics include optical fibers, integrated optics, transmitter and receiver optics, detection techniques, photon counting, digital and analog communication, and lidar. Prerequisite: Electrical Engineering 313 and 420, or equivalent. 1 unit.
461. **Signal Detection and Estimation.** Introduction to detection and estimation theory, with applications to communication, control, and radar systems; decision-theory concepts and optimum-receiver principles; detection of random signals in noise, coherent and noncoherent detection; and parameter estimation, linear and nonlinear estimation, and filtering. Prerequisite: Electrical Engineering 434 or equivalent, or consent of instructor. 1 unit.
463. **Information Theory.** Same as Computer Science 463 and Mathematics 463. See Mathematics 463.
464. **Topics in Digital Computer Arithmetic.** Same as Computer Science 464. See Computer Science 464.
465. **Topics in Automata Theory.** Same as Computer Science 465 and Mathematics 465. See Mathematics 465.
469. **Introduction to Coherent Optics and Holography.** Same as Computer Science 469. The diffraction transformation of aperture distributions between parallel planes and the imaging and Fourier-transforming properties of lenses; the theory of coherence; the principles of optical and digital holography; and devices and systems for optical data processing. 0 or 1 unit.
470. **Nonlinear Optics.** Light propagation in anisotropic crystals; second- and third-order nonlinear susceptibility and electro-optic effect; and discussion of the relationship of these effects along with such applications as light modulation, harmonic generation, and optical parametric amplification and oscillation. Prerequisite: Electrical Engineering 420. 1 unit.
472. **Quantum Electronics.** Brief theoretical introduction to quantum mechanics and atomic physics, with many applications in spin resonance and modern maser theory. Prerequisite: Physics 385 recommended. 1 unit.
474. **Topics in Graph and Geometric Algorithms.** Same as Computer Science 474. Design and analysis of computational methods for problems in graph theory and computational geometry; graph connectivity and isomorphism, flow in networks, and

- matching and covering; and geometric inclusion, proximity intersection and reachability, and applications to computational statistics. Prerequisite: Computer Science 373, or Computer Science 321 and either Mathematics 319 or Mathematics 313, or equivalent; or consent of instructor. 1 unit.
475. **Ionospheric Radio Propagation.** Propagation in a stratified medium; WKB solution; ray theory; ionospheric sounding; ionospheric transmission problems; scattering by irregularities; propagation in a random medium; cross-modulation and nonlinear effects; magneto-ionic theory; Faraday effect; whistler propagation; coupling of characteristic waves; magnetohydrodynamic waves; formation of ionospheric E-region; and formation of F-region. Prerequisite: Electrical Engineering 420 or equivalent. 1 unit.
477. **Advanced Antenna Theory.** Selected topics from recent engineering literature on antennas supplemented by advanced topics in electromagnetic theory needed for comprehension; current techniques for analysis of wire, slot, horn, frequency independent, quasi-optical, and array antennas. Prerequisite: Electrical Engineering 420. 1 unit.
480. **Optimization by Vector Space Methods.** Same as Mathematics 480. See Mathematics 480.
485. **Topics in Computer Hardware.** Same as Computer Science 485. See Computer Science 485.
486. **The Constitution and Behavior of the Upper Atmosphere.** Same as Physics 486. Chemical and dynamical processes in the upper atmosphere; emphasis on the processes by which emitted solar energy is transformed and the resulting behavior of the atmosphere and ionosphere. Prerequisite: Consent of instructor. 1 unit.
490. **Seminar in Special Topics.** Lectures and discussions on current research and literature on advanced topics in electrical engineering. Prerequisite: Advanced standing; consent of instructor. 0 to 1/2 unit. May be repeated for credit.
497. **Electrical Engineering Problems.** Lectures and discussions relating to new areas of interest. Prerequisite: Consent of instructor. 0 to 1 unit. May be repeated for credit.
498. **Individual Study.** Individual projects. Prerequisite: Consent of instructor. 1/4 to 2 units.
499. **Thesis Research.** 0 to 4 units

ELEMENTARY AND EARLY CHILDHOOD EDUCATION

Chairperson of Department: Professor F. A. Rodgers

Department Office: 311 Education Building, 1310 S. Sixth, Champaign

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
230. **Principles, Problems, and Issues in Elementary and Early Childhood Education.** Focuses on the problems and issues facing the classroom teacher in curriculum development, planning, and evaluation; develops and applies educational principles which serve to guide the teacher in dealing with these problems and issues. Prerequisite: For students pursuing the B.S. in elementary education, concurrent registration in Educational Practice 232. For students pursuing the B.S. in early childhood education, Elementary and Early Childhood Education 234 and concurrent registration in Educational Practice 232. 3 hours.
233. **Classroom Programs in Childhood Education.** Organizing balanced daily programs in childhood education; planning and using materials of instruction; and evaluating pupil achievement. Prerequisite: Junior standing; Educational Psychology 236. 2 hours.
234. **Theory and Process in Early Childhood Education.** Directed toward assisting the preservice teacher to understand his or her role in implementing curriculum in early childhood settings; deals with topics such as evaluation, communication, cognition,

and working with parents; and includes an eight-week practicum in local elementary and nursery schools and day care centers. Prerequisite: Educational Psychology 236. 5 hours.

237. **Theory and Process in Elementary School Teaching.** Directed toward affecting prospective teacher insight with regard to classroom behavior in teaching; includes materials dealing with child learning, teaching theory, and elementary school curriculum. A six-week morning assignment to a public school classroom is part of the course structure. Prerequisite: Educational Psychology 236. 5 hours.
249. **Independent Study.** Permits study of problems not considered in other courses; designed for students who excel in self-direction and intellectual curiosity. Prerequisite: Upperclassman; upper 5 percent of class in grade-point average; demonstrated writing competence, research potential, scholarly attitude, and interest as attested to by instructors; consent of adviser and staff member who supervises the work. 2 hours.
291. **Thesis.** Prerequisite: Senior standing. 2 hours.
292. **Thesis.** Prerequisite: Senior standing. 2 hours.
301. **Pediatrics and Nutrition.** Same as Foods and Nutrition 305 and Human Development and Family Ecology 305. See Foods and Nutrition 305.
304. **Literature for Elementary School Children.** Examines literature written for children and the uses of literature in the elementary school curriculum. Prerequisite: One college course in literature. 3 hours or 1 unit. Students may not receive credit for both Elementary and Early Childhood Education 304 and Library and Information Science 303.
331. **Teaching Social Studies in the Elementary School.** Emphasis on the role of social education in the elementary school; the formal instructional program in social studies, including the knowledge, skills, and sensitivities to be taught; the teaching strategies and materials employed; and the organization of learning experiences and the total program in addition to the educative impact of the elementary school as a social system. Prerequisite: Elementary and Early Childhood Education 234 or 237; junior standing. 3 hours, or 1/2 or 1 unit.
332. **Principles and Practices in Elementary Mathematics Education.** Organization, scope, and sequence of the elementary mathematics program and the functional nature of mathematics; methods, techniques, experiences, and materials of value in teaching elementary mathematics, and the role of classroom teacher. Prerequisite: Mathematics 202 and 203, or equivalent. 3 hours, or 1/2 or 1 unit.
333. **The Teaching of Language Arts in the Elementary School.** Goals, content, and teaching problems involved in the devising of programs in the area of elementary school language arts that are cumulative and sequential from kindergarten through the elementary school. Prerequisite: Elementary and Early Childhood Education 234 or 237; Educational Psychology 236. 3 hours, or 1/2 or 1 unit.
334. **Principles and Practices in Early Childhood Education.** Study of the principles and practices of using play as an educational tool in early childhood education; review of historical, philosophical, and psychological foundations of nursery-kindergarten methods; assessment of techniques relating play to various aspects of instruction; survey of materials and equipment; and presentation of methods of classroom evaluation. Prerequisite: Elementary and Early Childhood Education 234. 3 hours, or 1/2 or 1 unit.
335. **Science in the Elementary School.** The principles, place, and practice of science education in the elementary school and in the lives of children; stresses the functional nature of science and its place in the curriculum; and considers the organization of the science program, experiences and techniques of value in teaching, and the role of the classroom teacher and specialist. Opportunity for experience in field and laboratory work. Prerequisite: Elementary and Early Childhood Education 237, or equivalent; two years of college science. 3 hours or 1/2 unit.
336. **Fundamentals of Reading Techniques.** Same as Secondary Education 336. Basic principles, techniques, and materials for the developmental reading program; emphasis on methods and materials which provide for differentiated instruction.

- Prerequisite: Junior standing; registration in a teacher education curriculum. 3 hours, or 1/2 or 1 unit.
337. **Art Education in the Elementary School.** Methods, plans, and materials for teaching art as an integral part of the total educational program in the elementary school. Prerequisite: Junior standing. 3 hours or 1/2 unit.
340. **Principles and Practices for Fostering Independence in Reading.** Comprehension, study, and reference skills as they pertain to reading in the content fields; appropriate for elementary and junior high school majors, K through Grade Eight. Prerequisite: Elementary and Early Childhood Education 336. 3 hours or 1 unit.
344. **Parent Involvement Techniques for Teachers.** Principles and practices in working with parents in programs of involvement, education, and participation for elementary and early childhood teachers; includes techniques of reporting to parents, counseling with parents, guiding parent participation in schools, and developing relations with community agencies. Prerequisite: Elementary and Early Childhood Education 234 or graduate standing. 3 hours or 1 unit.
348. **Speech and Language Clinical Methods in the Schools.** Same as Speech and Hearing Science 348. See Speech and Hearing Science 348.
354. **Audio-Visual Communication.** Same as Secondary Education 354. Analysis and application of those introductory aspects of communication theory and practices concerned with the design and use of audio-visual messages which influence the learning process; the selection, utilization, production, and evaluation of audio-visual materials and selected technological aids. Prerequisite: Senior or graduate standing. 3 hours, or 1/2 or 1 unit.
359. **Workshop and Laboratory in Curriculum Development.** Curriculum development projects in specialized fields of elementary and early childhood education. Prerequisite: Junior standing. 2 or 4 hours or 1/2 or 1 unit. May be repeated to a maximum of 2 units toward any one degree.
381. **Culture in the Classroom.** Overview of the social and cultural factors which affect learning and teaching, and applications of cultural information to curriculum development, classroom practices, and evaluation. 2 or 4 hours, or 1/2 or 1 unit.
399. **Issues and Developments in Elementary and Early Childhood Education.** A seminar course on topics not treated by regularly scheduled courses; requests for initiation may be made by students or faculty members. Prerequisite: Junior standing. 2 to 4 hours, or 1/2 to 1 unit. May be repeated to a maximum of 8 hours or 2 units.
407. **Principles and Practices in Early Childhood Education.** Includes principles underlying education practices in day care centers, preschool/nursery and kindergarten settings derived from theory and research in developmental psychology, social psychology, anthropology, and other related disciplines. Prerequisite: Satisfactory completion of introductory courses in developmental psychology, educational psychology, and general psychology. 1 unit.
421. **Issues and Trends in Reading.** Discusses and researches the evolution of current issues and trends in reading. Prerequisite: Elementary and Early Childhood Education 336. 1 unit.
426. **Inservice Education.** Presents theoretical constructs relating to continuing professional growth with particular emphasis on incentive structures, and the organization, delivery, and evaluation of professional development activities. 1 unit.
429. **Corrective Reading Instruction in the Classroom.** Nature, causes, and diagnosis of reading difficulties; translation of diagnostic information into instructional practice. Prerequisite: Elementary and Early Childhood Education 336 or 340, or equivalent. 1 unit.
430. **Clinical Practicum in Corrective Reading.** Diagnostic procedures and individual instruction with small groups of children who have reading difficulties. Prerequisite: Elementary and Early Childhood Education 429. 1 unit.
431. **Elementary School Classroom Programs.** Exploration of organizational centers for determining selection and sequence of educative experiences in the elementary

- school classroom; emphasis on the role of the teacher in curriculum construction. 1 unit.
432. **Clinical Diagnosis and Remediation in Reading.** Supervised experience in the reading center; special attention to evaluative and interpretative techniques in cases of severe reading disabilities based on the analysis of specific reading needs. Prerequisite: Elementary and Early Childhood Education 429; a course in individual mental testing. 1 unit. May be repeated to a maximum of 2 units.
434. **Programs in Early Childhood Education.** Advanced course intended primarily for teachers and supervisors of younger children, ages three to eight; review and analysis of research findings, experimentation, and current trends in curriculum organization, procedures, and materials essential to developing classroom programs for children. 1 unit.
435. **Diagnosis and Correction in Elementary Mathematics.** The nature, causes, and correction of mathematical difficulties at the elementary level; process of evaluation through group and individual procedures; the development and use of diagnostic instruments and corrective techniques; and supervised experience with pupils having difficulties. Prerequisite: Elementary and Early Childhood Education 332 and Educational Psychology 392, or equivalent. 1 unit. May be repeated to a maximum of 2 units.
436. **Field Instruction in Reading Programs.** Directed practice in the area of reading; students are placed in an approved and supervised field position for part of the semester. 1 unit.
437. **Methods of Child Study.** Study of ways in which teachers can evaluate child behavior and development with emphasis on classroom application; instruction and practice in the use and interpretation of observations, anecdotal records, rating scales, interviews, achievement tests, intelligence tests, questionnaires, and sociometric and projective techniques. Prerequisite: Educational Psychology 312 or consent of instructor. 1 unit.
438. **The Organization and Supervision of School Reading Programs.** Study of procedures for planning, improving, and evaluating reading programs on a system-wide basis. Open only to those persons who are preparing to supervise reading programs or with approval of graduate adviser. Prerequisite: Elementary and Early Childhood Education 429; Elementary and Early Childhood Education 433 (reading section). 1 unit.
439. **Fundamentals of Curriculum Development.** Explores the several theoretical bases of curriculum planning and the implications of these approaches for practice. 1 unit.
441. **Reading Instruction in Nursery School Through Grade Two.** Planning and evaluating reading instruction and materials in nursery school through Grade Two. Prerequisite: Elementary and Early Childhood Education 336 or 340, or equivalent; or consent of instructor. 1 unit.
442. **Readings in Elementary Mathematics Education.** Deals with influences which historically have had and currently are having effects on elementary mathematics programs; reviews the learning theories, research and curriculum development projects in regard to program implications. Problems and issues in modern programs. Prerequisite: Elementary and Early Childhood Education 431 or 434. 1 unit.
443. **Development of Elementary Mathematics Programs.** Deals with criteria and considerations for developing or modifying elementary mathematics programs, strategies for developing curriculum in the major content areas of elementary mathematics, and alternative instructional procedures. Prerequisite: Elementary and Early Childhood Education 332 or equivalent; or consent of instructor. 1 unit.
449. **Independent Study.** Offers opportunity and challenge of self-directive, independent study, that is, develops the individual's ability as an independent student, and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department chairman prior to enrollment. 1/2 or 1 unit. No more than 2 units may be offered toward an advanced degree except by consent of the Dean of the College of Education.

- 451. Evaluation of Educational Programs.** Same as Educational Psychology 451. Origins, assumptions, applications, and development of approaches to educational program evaluation in practice over the past twenty years; unobtrusive measures and noneducation evaluation systems; and practice in collecting evaluative data. Prerequisite: Educational Psychology 390, one year of work with youth in an institutional setting, or consent of instructor. 1 unit.
- 457. Current Issues in Elementary Science Education.** Advanced seminar in science education for teachers, consultants, and administrators, preschool through the elementary grades: identifies major problems and issues; overview and analysis of current trends and research; development of a personalized philosophy related to science education; and opportunity to conduct an independent research project. Prerequisite: Elementary and Early Childhood Education 335 or equivalent, and two years of college science; or consent of instructor. 1 unit.
- 461. Research and Trends of the Language Arts Curriculum.** Investigates research, trends, issues, and innovative practices for teachers and educators on the teaching of the language arts in the elementary school; identifies and develops procedures for organizing and implementing new knowledge and research into the elementary school curriculum. Prerequisite: Credit in one course in the teaching of reading, one course in the language arts, and one year of teaching experience; or consent of instructor. 1 unit.
- 462. Theory and Practice in Children's Composition.** Studies composition or writing, its beginning and progress throughout the elementary grades; gives particular attention to the relationship between creativity and imagination and the basic skills of punctuation, spelling, and other conventions of writing; and examines research studies on functions of writing, motivation, and purposes for writing during the elementary school years. 1 unit.
- 463. Children's Literature and the Elementary School Curriculum.** Investigates trends and issues related to teaching children's literature in the elementary school; focuses attention upon the organization and planning of a balanced children's literature curriculum (fictional and informational) for grades K-8. Prerequisite: Credit in one course in children's literature and one course in English literature; or consent of instructor. 1 unit.
- 465. Linguistics and the Elementary School Curriculum.** Analyzes linguistics and its implications for the elementary school curriculum including dialect diversities, new theories of grammar, lexicography, and variations in oral and written forms of language; gives attention to how teachers apply these principles in the construction of language arts programs. Prerequisite: Credit in a course in English grammar linguistics, or consent of instructor. 1 unit.
- 466. Contemporary Classics in Children's Literature.** Critically examines children's books that have received major national and international awards and prizes and the requirements for that distinction; given particular attention to the most recent publications so honored and their implications for use in the elementary classrooms. Prerequisite: Credit in one course in children's literature and one course in English literature, or consent of instructor. 1 unit.
- 471. Theory and Practice of Staff Development.** Surveys the relationship between curriculum change and staff development; gives primary attention to various forms of curricular modification and corresponding staff development requirements; in addition, compares alternative approaches to staff development in order to determine their specific applicability in instructional improvement. 1 unit.
- 490. Seminar for Advanced Students of Education.** Seminar in elementary and early childhood education. Prerequisite: Admission to doctoral study in elementary and early childhood education. 0 to 2 units.
- 491. Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems. Students are expected to present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are

expected to analyze critically all presentations. Limited to students who have been admitted for doctoral study. 1 to 2 units.

499. **Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units

ENGINEERING

Program Administrator: Professor H. L. Wakeland

Program Office: 207 Engineering Hall, 1308 West Green, Urbana

100. **Engineering Lecture.** Engineering lecture for freshmen; selected topics each week. Required of freshmen in the College of Engineering. 0 credit.
101. **Cooperative Engineering Education Seminar.** Discussion seminar which gives an introduction to cooperative engineering education. Topics discussed include duties and responsibilities of the student; duties and responsibilities of the cooperative employer; and techniques for obtaining maximum benefits from the program. Prerequisite: Cooperative student in any engineering curriculum. 0 credit.
102. **Cooperative Engineering Education Practice.** Off-campus practice of engineering in government or industry. Prerequisite: Cooperative student in any engineering curriculum. 0 credit.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Engineering Lecture.** Required of off-campus transfer students in the College of Engineering. Meets for first three weeks of each semester; selected topics. 0 credit.
298. **Executives in the Technological World.** Offers a series of seminars by executives from industrial and technical organizations; provides students an opportunity to better understand the role of the technological executive as a decision-maker in the contemporary world; and discusses current trends, practices, economic conditions, productivity, government regulation, and foreign trade from the viewpoint of a wide range of industries such as transportation, steel, energy, and electronics. Prerequisite: Junior or senior standing in engineering, or consent of instructor. 1 hour.
299. **Engineering Study Abroad.** Provides campus credit for foreign study and/or provides a mechanism for engineering students to maintain continuous enrollment on this campus. If objective is study abroad for credit, a detailed proposal must be submitted by the student for approval by a committee of the department in which the student is studying and the college office prior to such study abroad. Final determination of credit and its application toward the student's degree is made after a review of the student's work abroad by the above committee and the college office. Prerequisite: Completion of sophomore year in engineering; approval of student's proposed study program by his department and the college office. 0 to 15 hours (summer session, 0 to 7 1/2 hours)

ENGINEERING HONORS

Executive Secretary of Program: Professor R. W. Bokenkamp

Program Office: 207 Engineering Hall, 1308 W. Green, Urbana

196. **The Engineer and Society.** Prerequisite: Freshman James Scholar. 2 hours.
198. **Honors Seminar.** Special lecture sequence and/or discussion groups arranged each semester for freshman James Scholars to enable them to explore at their own level various aspects of technology that are of interest to them. Prerequisite: Honors student in the University. 1 to 4 hours.
297. **College Honors Seminar.** Special lecture sequences and/or discussion groups arranged each semester in special interdisciplinary subjects of current interest for

James Scholars in engineering. Prerequisite: James Scholar in engineering or consent of instructor. 1 to 4 hours

ENGLISH

(Including Business and Technical Writing and Rhetoric and Composition)

Head of Department: Professor K. Kinnamon

Department Office: 208 English Building, 608 S. Wright, Urbana

Business and Technical Writing

Business and Technical Writing Office: 100 English Building

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
251. **Business and Administrative Communication.** Study of communication as a tool of administration and management; practice in writing a wide variety of types and forms of communication; and inclusion of oral and visual communication with the written to provide an integrated approach. For the student whose career will be in administration and management requiring a broad range of communication skills. Prerequisite: Completion of campus rhetoric requirement and sophomore standing. 3 hours.
271. **Sales Writing.** Same as Advertising 288. Direct mail campaigns and company magazine copy. Prerequisite: Completion of campus rhetoric requirement and sophomore standing. 3 hours.
272. **Report Writing.** Personal direction in a report writing project which can be integrated with research in another course; study of report-writing principles and practices. Classes meet for the first month after which the student and the instructor arrange a conference schedule. Small group meetings are arranged for presentation of proposals, progress reports, and summary reports. Prerequisite: Completion of campus rhetoric requirement and sophomore standing. 3 hours.
290. **Individual Study.** Independent research with a chosen tutor leading to the writing of a formal report or preparation of some other type of major presentation of information. Enroll in Business and Technical Writing office, 100 English Building, Urbana. Prerequisite: Consent of instructor. 0 to 3 hours. May be repeated to a maximum of 6 hours.
302. **Descriptive English Grammar.** Same as English 302. See English 302.
400. **Technical and Professional Writing.** Grammar, syntax, diction, paragraph development, and logic as they relate to technical and professional exposition; practice in defining problems for scientific investigation, organizing information and outlining, preparing headings and abstracts, drafting and revising papers, and presenting information graphically and orally. Prerequisite: Graduate standing. 3 hours. No graduate credit

English

101. **Introduction to Poetry.** Reading and discussion of representative poems of several periods and types. 3 hours.
102. **Introduction to the Drama.** Reading and discussion of representative plays of several periods and types. 3 hours.
103. **Introduction to Fiction.** Reading and discussion of representative fiction of several periods and types. 3 hours.

104. **Introduction to Film.** Understanding of narrative films through the viewing and discussion of a representative body of film classics drawn from the entire range of world cinema; emphasizes the basic elements of cinematic expression, and concerns major movements, periods, and genres. 3 hours.
106. **Literature and Experience.** Understanding of the relationship between literature and human experience through the study of significant, recurrent themes. 3 hours. May be repeated once as topics vary.
107. **Law in Literature.** The portrayal of law and the legal system in literature with particular emphasis on the impact of that system on society and the relationship between private morality and public law; includes guest speakers from the legal profession. 3 hours.
113. **The Idea of Comedy.** A selective introduction to the theory and practice of comedy; examines a number of influential theories of comedy and a variety of comic forms including poetry, novels, essays, plays, and short stories. 3 hours.
115. **Masterpieces of English Literature.** Study of selected major writings. 3 hours.
116. **Masterpieces of American Literature.** Study of selected major writings. 3 hours.
118. **Introduction to Shakespeare.** Representative readings of Shakespeare's drama and poetry in the context of his age, with emphasis on major plays; selections vary from section to section. Does not fulfill Shakespeare requirement for the English concentration. 3 hours.
119. **The Literature of Fantasy.** Same as Comparative Literature 119. Surveys masterworks in the romance-tradition from Shakespeare's time to the present; as distinct from science fiction, the materials feature magic and the supernatural rather than technology; and includes stage romance, fairy tale, horror tale, and fantasy-novel. Individual works are set in their historical and literary contexts. 3 hours.
120. **Science Fiction.** A literary and historical study of science fiction from Mary Shelley to Ursula K. LeGuin with particular emphasis on the achievement of science fiction as a literary form in the romance tradition. 3 hours.
180. **Drama in Production.** Study, discussion, and production of a dramatic text. 3 hours. May be repeated once as topic varies.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
198. **Freshman Honors Seminar.** Introduction to the study of literature, with emphasis on individual work in fundamental problems of literary analysis; works studied are usually a combination either of short poems and short stories or of novels and plays. Prerequisite: James Scholar standing or other designation as a superior student. 4 hours. May be repeated once as topics vary.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
202. **Medieval Literature and Culture.** Same as Comparative Literature 253. British and continental authors (including Chaucer) read in modern English. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
204. **Renaissance Literature and Culture.** Same as Comparative Literature 255. Readings in English and continental literary masterpieces with attention to the significant cultural influences of the period. 3 hours.
206. **Literature and Culture of the Enlightenment.** Same as Comparative Literature 257. Readings in English and continental literature of the eighteenth century, with attention to significant cultural influences. 3 hours.
207. **Nineteenth-Century Literature and Culture.** Same as Comparative Literature 259. English and Continental literature of the nineteenth century, with attention to major intellectual and social movements. 3 hours.
209. **English Literature from the Beginning to 1798.** Historical and critical study of selected works of English literature to 1798 in chronological sequence. 3 hours.
210. **English Literature from 1798 to Present.** Historical and critical study of selected works of English literature after 1798 in chronological sequence. 3 hours.

211. **Introduction to Modern African Literature.** Same as African Studies 210 and Comparative Literature 210. See African Studies 210.
215. **Practical Criticism.** Introduction to applied literary criticism. Prerequisite: English 101. 3 hours.
240. **The English Romantic Poets.** Blake, Wordsworth, Scott, Coleridge, Byron, Shelley, and Keats. 3 hours.
241. **The Beginnings of Modern Poetry.** American and British poets including Frost, Robinson, Sandburg, Lindsay, Hardy, Hopkins, Housman, Yeats, Lawrence, the Imagists, and the early Pound and Eliot. 3 hours.
242. **Poetry Since 1940.** 3 hours.
243. **Development of the Modern Drama.** Same as Comparative Literature 265. Ibsen to O'Neill. 3 hours.
244. **Development of the Modern Drama.** Same as Comparative Literature 266. Pirandello to the present. 3 hours.
245. **The Short Story.** Same as Comparative Literature 267. Historical and critical study of the short story (American and European) from the early nineteenth century to World War I; major emphasis on such authors as Hawthorne, James, Crane, Gogol, Chekhov, Maupassant, Flaubert, Joyce, and Mansfield. 3 hours.
246. **The Short Story.** Same as Comparative Literature 268. Historical and critical study of the short story (American and European) from World War I to the present; major emphasis on such authors as Anderson, Hemingway, Faulkner, Porter, Mann, Kafka, Maugham, Lawrence, Salinger, and Camus. 3 hours.
247. **The British Novel.** Critical study of representative British novels from different literary periods. 3 hours.
248. **Modern British and American Fiction in Relation to Continental Fiction.** Same as Comparative Literature 269. An examination of important thematic and structural relationships-- influences, parallels, and variations--among selected major works of the nineteenth and twentieth centuries; readings chosen from works of Bronte, Hardy, Lawrence, Woolf, James, Faulkner, Bellow, Oates, Dostoevsky, Tolstoy, Stendhal, Flaubert, Camus, Kafka, Mann, Hesse, Moravia, and Pavese. All works read in English. 3 hours.
249. **The American Novel.** Study of major and representative novels from the beginnings to the present. 3 hours.
250. **American Drama.** Reading and analysis of selected plays from the history of American drama, with emphasis on the period from O'Neill to the present. 3 hours.
255. **Survey of American Literature, I.** American literature and its cultural backgrounds to 1900. 3 hours.
256. **Survey of American Literature, II.** American literature and its cultural backgrounds in the twentieth century. 3 hours.
259. **Afro-American Literature, I.** Same as Afro-American Studies 259. Historical and critical study of Afro-American literature in its social and cultural context from the beginning to 1915. 3 hours.
260. **Afro-American Literature, II.** Same as Afro-American Studies 260. Historical and critical study of Afro-American literature in its social and cultural context since 1915. 3 hours.
273. **Film as Literature.** Critical study of narrative films, with viewing and discussion of a major film each week; in-depth study of selected directors, genres, and themes; emphasis on aspects of film aesthetics, criticism, and history. Prerequisite: English 104 or a college-level course in literature or film. 3 hours.
274. **Literature in Its Cultural Contexts.** Studies of literature from the point of view of other disciplines. See Timetable for current topics. 3 hours.
275. **Literature and Psychology.** Psychological and psychoanalytical theories as they bear on the interpretation of literature. 3 hours.
277. **Modern Literary Criticism.** Same as Comparative Literature 205. Important modern theories and methods of literary criticism and their relations to the study of literary texts. 3 hours.

280. **Women Writers.** Study of British and American women authors. 3 hours. May be repeated to a maximum of 6 hours as topic varies.
281. **Women in the Literary Imagination.** A study of the way various writers, both men and women, have portrayed woman's image, social role, and psychology in English or American literature. 3 hours. May be repeated to a maximum of 6 hours as topic varies.
284. **Jewish Experience in Literature.** Same as Comparative Literature and Religious Studies 284. Selected topics involving works by Jewish and non-Jewish writers concerned with various aspects of Jewish life. 3 hours. May be repeated to a maximum of 6 hours as topic varies.
290. **Individual Study.** Study of selected topics. Prerequisite: Consent of instructor. 0 to 3 hours. May be repeated for a total of 6 hours. Students may register in this course more than once in the same term.
291. **Honors Individual Study.** Study of selected topics. Restricted to English and English education concentrators with a 4.25 average who are working towards the degree with Distinction in English or in English education. Enrollment in appropriate honors office necessary. Prerequisite: Consent of English honors or English education honors adviser. 1 to 3 hours. May be repeated to a maximum of 6 hours.
293. **Honors Senior Thesis.** Independent research with a chosen tutor leading to the writing of a thesis. Restricted to English or English education majors with a 4.25 average who have satisfied all other requirements towards the degree with distinction; enrollment in the English Honors Office necessary. 3 hours.
296. **Honors Seminar, I: Themes, Movements, and Forms in British and American Literature.** Prerequisite: James Scholar status in any department; for English Department concentrators, a 4.25 grade-point average or consent of director of honors program. Enrollment through the English Honors Office necessary. Offered every semester with varying topics; may be repeated as topic varies. 3 hours.
297. **Honors Seminar, II: Periods in British and American Literature.** Prerequisite: James Scholar status in any department; for English Department concentrators, a 4.25 grade-point average or consent of director of honors program. Enrollment through the English Honors Office necessary. Offered every semester with varying topics; may be repeated as topic varies. 3 hours.
298. **Honors Seminar, III: Major British and American Authors.** Each seminar considers one or two major authors. Prerequisite: James Scholar status in any department; for English Department concentrators, a 4.25 grade-point average or consent of director of honors program. Enrollment through the English Honors Office necessary. May be repeated as topic varies. 3 hours.
301. **Introduction to the Study of the English Language.** Language theories and modes of language study applied to English. 3 hours or 1 unit.
302. **Descriptive English Grammar.** Same as Business and Technical Writing 302. 3 hours or 1 unit.
303. **Historical Introduction to the English Language.** 3 hours or 1 unit.
304. **Stylistics and Literary Criticism.** Same as Linguistics 312. Techniques of linguistic analysis applied to problems in literary criticism; emphasis on contributions of structuralism, transformational grammar, and speech act theory to discourse analysis, morphology of narrative structure, poetics, metaphor theory, statistical measurement of style, and the sociolinguistics of literature. Prerequisite: One year of college literature or consent of instructor. 3 hours or 1 unit.
311. **Chaucer.** A selection read in Middle English. Prerequisite: One year of college literature, or consent of instructor. 1 unit.
315. **Poetry and Prose of the English Renaissance, 1500-1600.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
316. **The Drama of Shakespeare's Contemporaries.** Tudor and Stuart drama. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.

317. **Spenser.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
318. **Shakespeare, I.** Earlier tragedies, comedies, and history plays. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
319. **Shakespeare, II.** Mature tragedies, dark comedies, and late romances. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
321. **Poetry and Prose from the Metaphysicals to 1660.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
323. **Milton.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
326. **The Age of Dryden, Pope, and Swift.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
327. **The Age of Johnson.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
328. **English Drama of the Restoration and Eighteenth Century.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
329. **Restoration and Eighteenth-Century Fiction.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
331. **English Romantic Literature.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
334. **Victorian Poetry and Nonfiction Prose.** Study of such major poets as Tennyson, Browning, Arnold, and Hardy; and of prose writers including Carlyle, Mill, Arnold, Pater, and Huxley. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
335. **Nineteenth-Century British Fiction.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
341. **British Literature in the Twentieth Century to 1930.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
342. **British Literature in the Twentieth Century Since 1930.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
343. **The Plays of Bernard Shaw.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
347. **Literature of the American Renaissance.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
350. **American Literature from the Civil War to the First World War.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
351. **American Literature from the First World War to the Present.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
355. **Major Authors.** Intensive study of the work of one or two major authors. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit. May be repeated as topic varies.
361. **Topics in English and American Literature.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit. May be repeated as topic varies.
362. **Topics in Modern Fiction.** Same as Comparative Literature 362. Topics including theme, genre, and literary movements, predominantly in English nineteenth- and twentieth-century fiction, with occasional consideration of continental fiction in English translation; topics may vary from semester to semester. Prerequisite: One year of college literature or consent of instructor. 3 hours or 1 unit. May be repeated once as topic varies.
365. **Comedy.** Same as Comparative Literature 365. History and theory of stage comedy. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
366. **Topics in Modern Drama.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.

367. **The International Folk Tale.** Same as Comparative Literature 359. Origin, nature, and distribution of the folk tale. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
368. **The Ballad and Folksong in the United States.** English- language traditional songs and ballads, transplanted and native. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
370. **Modern African Fiction.** Same as African Studies, Comparative Literature, and French 310. See African Studies 310.
375. **Topics in the Relation of Other Disciplines to the Study of Literature.** See Timetable for current topics. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit. May be repeated once as topic varies.
381. **Theory and Practice of Written Composition.** History and theory of written composition; basic rhetorical principles; and guidance and criticism of student writing. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
382. **Literary Criticism from Plato to 1800.** Same as Comparative Literature 304. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
383. **Literary Criticism from 1800 to the Present.** Same as Comparative Literature 305. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
385. **Literature for the High School.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
387. **Topics in Folklore.** Same as Comparative Literature, German, Slavic and Speech Communication 387. Presents selected topics in folklore studies that deal with a particular theme, ethnic group, region, genre, or interpretive approach; topics vary. Prerequisite: One year of college literature or consent of instructor. 3 hours or 1 unit. May be repeated as topics vary to a maximum of 6 hours or 2 units.
400. **Introduction to Research and Critical Techniques.** Introductory course in methods and techniques in research and literary criticism. 1 unit.
404. **Seminar in the English Language.** Study of English linguistics. 1 unit.
407. **Old English.** Introduction to the language before 1000 A.D. 1 unit.
408. **Beowulf.** Prerequisite: English 407 or consent of instructor. 1 unit.
409. **Old English Literature and Its Cultural Background.** Prerequisite: English 407 or consent of instructor. 1 unit. May be repeated as topic varies.
411. **Chaucer: Troilus and Criseyde and the Minor Poems.** 1 unit.
412. **Chaucer: The Canterbury Tales.** 1 unit.
413. **Middle English Literature and Its Cultural Background.** 1 unit. May be repeated as topic varies.
414. **Seminar in Medieval Literature.** Prerequisite: A college course devoted entirely to an aspect of medieval studies, or consent of instructor. 1 unit. May be repeated as topic varies.
419. **Seminar in Shakespeare.** Prerequisite: A college course devoted entirely to an aspect of Shakespeare's work, or consent of instructor. 1 unit. May be repeated as topic varies.
420. **Seminar in Sixteenth-Century Literature.** Prerequisite: A college course devoted entirely to an aspect of Renaissance studies, or consent of instructor. 1 unit. May be repeated as topic varies.
424. **Seminar in Seventeenth-Century Literature.** Prerequisite: A college course devoted entirely to an aspect of Renaissance studies, or consent of instructor. 1 unit. May be repeated as topic varies.
427. **Seminar in Restoration and Eighteenth-Century Literature.** Prerequisite: A college course devoted entirely to an aspect of eighteenth-century studies, or consent of instructor. 1 unit. May be repeated as topic varies.
433. **Seminar in Romantic Literature.** Same as Comparative Literature 452. Prerequisite: A college course devoted entirely to an aspect of Romantic studies, or consent of instructor. 1 unit. May be repeated as topic varies.

- 437. **Seminar in Victorian Literature.** Prerequisite: A college course devoted entirely to an aspect of Victorian studies, or consent of instructor. 1 unit. May be repeated as topic varies.
- 443. **Seminar in Modern British Literature.** Prerequisite: One college course devoted entirely to an aspect of modern British studies, or consent of instructor. 1 unit. May be repeated as topic varies.
- 447. **Seminar in Earlier American Literature.** Prerequisite: One college course devoted entirely to an aspect of American studies, or consent of instructor. 1 unit. May be repeated as topic varies.
- 453. **Seminar in Later American Literature.** Prerequisite: One college course devoted entirely to an aspect of American studies, or consent of instructor. 1 unit. May be repeated as topic varies.
- 463. **Seminar in Literary Themes and Movements.** Prerequisite: One year of graduate study of literature, or consent of instructor. 1 unit. May be repeated as topic varies.
- 464. **Seminar in Literary Modes and Genres.** Prerequisite: One year of graduate study of literature, or consent of instructor. 1 unit. May be repeated as topic varies.
- 469. **Seminar in the Stage History of Classic English Plays.** Same as Speech Communication 469 and Theatre 405. Analysis and reconstruction of past productions of classic plays, with special reference to Shakespeare. Prerequisite: One year of work in dramatic literature or theatre history, or consent of instructor. 1 unit.
- 478. **Seminar in the Relation of Other Disciplines to the Study of Literature.** Prerequisite: One year of graduate study of literature, or consent of instructor. 1 unit. May be repeated as topic varies.
- 481. **Seminar in Literary Theory and Criticism.** Prerequisite: A college course devoted entirely to criticism, or consent of instructor. 1 unit. May be repeated as topic varies.
- 484. **Narrative Semiotics.** Same as Comparative Literature, French, and Religious Studies 484. See French 484.
- 487. **Seminar in the Teaching of English.** Prerequisite: One year of college study of literature, or consent of instructor. 1 unit. May be repeated as topic varies.
- 491. **Research in Special Topics.** Independent study under the guidance of a member of the graduate faculty. 1 unit. May be repeated for a total of 2 units.
- 492. **Master's Comprehensive Examination Tutorial.** Reading for the Master's Comprehensive Examination under the guidance of the candidate's graduate adviser. 6 or 12 hours. May be taken once for 12 hours or twice for 6 hours. No graduate credit.
- 493. **Professional Seminar in the Teaching of College English.** Prerequisite: Graduate standing in the Department of English or consent of instructor. 0 to 1 unit. May be repeated by Ph.D. candidates as the topic varies but without credit after two units have been earned in this course. Students needing the proseminar for their programs will be given priority enrollment.
- 499. **Thesis Research.** Guidance in writing theses for doctoral degrees. Prerequisite: Doctoral candidate standing. 0 to 4 units

Rhetoric and Composition

- 103. **Writing Laboratory.** Intensive tutoring in basic writing skills to be scheduled at the Writing Laboratory. Open only to students in the EOP Rhetoric Program or to those in the special option sections. Prerequisite: Concurrent registration in Rhetoric 104 or 105, or written consent from the EOP Rhetoric Program Office. 1 hour. May be repeated for a total of 2 hours.
- 104. **EOP Rhetoric.** An introductory writing course designed for EOP students and with concentration on exposition; must be taken concurrently with Rhetoric 103, a 1-hour course offered at the Writing Laboratory. 3 hours.
- 105. **Principles of Composition.** Study of the methods of exposition, the problems of argument, the use of evidence, and style; practice in expository writing. This course fulfills the campus rhetoric requirement. 4 hours.

108. **Forms of Composition.** Study of the methods of exposition, the problems of argument, the use of evidence, and style; practice in expository writing. Students are admitted on the basis of ACT verbal scores or equivalent. See Timetable for current topics. This course fulfills the campus rhetoric requirement. 4 hours.
133. **Principles of Composition.** Practice in exposition, with emphasis on organization, paragraphing, and sentence structure. For the student whose career will require competence in writing clear, precise prose as an adjunct to another professional activity. Credit is not given for Rhetoric 133 and Rhetoric 143. Prerequisite: Fulfillment of campus rhetoric requirement, or consent of instructor. 3 hours.
143. **Intermediate Expository Writing.** Practice in expository types, with emphasis on style and critical analysis. Recommended for rhetoric majors. Credit is not given for Rhetoric 143 and Rhetoric 133. Prerequisite: Fulfillment of campus rhetoric requirement, or consent of instructor. 3 hours.
144. **Narrative Writing.** Introduction to and practice in the writing of narrative prose, with primary emphasis on short fiction. Prerequisite: Fulfillment of campus rhetoric requirement, or consent of instructor. 3 hours.
145. **Poetry Writing.** Practice in the writing of poetry; experimentation with a number of fixed forms and free verse, but emphasis mainly on the student's freedom to develop a personal style. Prerequisite: Fulfillment of campus rhetoric requirement, or consent of instructor. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
202. **Communications Workshop.** Independent writing projects and examination of literature as the cultural basis of the student's specialized fields. 3 hours.
205. **Advanced Narrative Writing, I.** Practice in the writing of fiction, with emphasis on the short story. Prerequisite: Rhetoric 144 or equivalent, or consent of instructor. 3 hours.
227. **Advanced Expository Writing.** Types of nonfiction prose, including the essay, criticism, biography, and historical writing. Prerequisite: Rhetoric 133 or 143, or consent of instructor. 3 hours.
302. **Advanced Writing Topics.** Practice in various literary genres and in their combinations for mature students who have some writing experience and a background of data and impressions which they wish to develop in writing of near-professional quality. Individual conferences at hours to be arranged. Prerequisite: Rhetoric 133 or 143, or equivalent; or consent of instructor. 3 hours or 1 unit.
305. **Advanced Narrative Writing, II.** Continued practice in the writing of fiction, with emphasis on the longer story. Prerequisite: Rhetoric 205 or equivalent, or consent of instructor. 3 hours or 1 unit.
306. **The Writing of Poetry.** Practice of the writing of poetry aided by intensive study of examples. Prerequisite: Rhetoric 145 or equivalent, or consent of instructor. 3 hours or 1 unit. May be repeated for a maximum of 6 hours or 2 units.
355. **Creative Writing Tutorial.** Personal direction in a writing project: fiction (novel or short stories), poetry, criticism, narrative, etc. Frequency of conference to be determined by the type of project. Prerequisite: A preparatory course in advanced writing (Rhetoric 205, 227, 305, or 306). 3 hours or 1 unit. May be repeated for a maximum of 6 hours or 2 units.

ENGLISH AS A SECOND LANGUAGE

Director of Division: Professor H. D. Brown

Division Office: 3070 Foreign Languages Building, 707 South Mathews, Urbana

109. **English as a Second Language.** Intensive course in basic English structure for foreign students who are inadequately prepared for either English as a Second Language 111 or 114. Prerequisite: Reading knowledge of English and ability to

- understand simple instructions; recommendation from Illinois placement test. 0 credit.
110. **English as a Second Language.** Study of the sounds and intonation patterns of American English and the relation of sound to spelling; designed to improve the student's ability to speak and understand English at normal conversational speed. May also be taken with English as a Second Language 111 and 114. Prerequisite: Reading knowledge of English and ability to understand simple instructions; recommendation from Illinois placement test, or consent of instructor. 0 credit.
 111. **English as a Second Language.** Continuation of English as a Second Language 109. Rapid and intensive review of basic English structure and a study of more complicated sentence patterns with practice in simple oral and written composition. Designed for students inadequately prepared for English as a Second Language 114. Prerequisite: English as a Second Language 109 or recommendation from Illinois placement test, or consent of instructor. 0 credit.
 114. **English as a Second Language.** Composition for undergraduate students whose native language is not English. Prerequisite: English as a Second Language 111, recommendation from overseas test or Illinois placement test, or consent of instructor. 3 hours.
 115. **English as a Second Language.** Composition for undergraduate students whose native language is not English. Prerequisite: English as a Second Language 114 or equivalent, recommendation from Illinois placement test, or consent of instructor. 3 hours.
 199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
 301. **Topics in Applied TESL/TEFL Theory.** Implications of TESL/TEFL theory and research for classroom practice: preparation of teaching and testing materials; evaluation of materials on the basis of ESL/EFL teaching experiences; adaptation to needs of different learner ages, language, and achievement backgrounds; and new teaching formats. Prerequisite: Consent of instructor. 2 to 4 hours, or 1/2 to 1 unit. May be repeated as topic varies to a maximum of 8 hours or 2 units.
 302. **Descriptive English Grammar for ESL Teachers.** Adapts modern English grammar to the needs of the ESL teacher, emphasizing the development of analytical skills that can be applied to syntactic and lexical analysis. 3 hours or 3/4 unit.
 305. **Introduction to Applied Linguistics.** Same as Linguistics 305. See Linguistics 305.
 350. **Introduction to Sociolinguistics.** Same as Linguistics 350. See Linguistics 350.
 360. **Principles of Language Testing.** Same as French, German, and Spanish 360. Studies theoretical and practical aspects of language testing: examines purposes and types of language tests in relation to theories of language use and language teaching goals; discusses testing practices and procedures related to language teaching and language research; and includes the planning, writing, and administration of tests, basic descriptive statistics, and test analysis. A project is required. Prerequisite: English as a Second Language 389. 3 hours or 3/4 unit.
 371. **Teaching Composition in the ESL Classroom.** Applies select principles of linguistics, rhetoric, crosscultural communication, and second language acquisition to developmental instruction in ESL writing; required projects: article reviews, instructional materials analysis and preparation, and ESL class observation. Prerequisite: English as a Second Language 301. 3 hours or 3/4 unit.
 382. **Computer-Based Foreign Language Teaching.** Same as Classical Civilization, French, German, Humanities, Slavic, and Spanish 382, and Linguistics 386. See Humanities 382.
 388. **English Phonology and Morphology for ESL Teachers.** Same as Linguistics 388. Application of linguistics to language learning with special emphasis on the learning of English as a second language. Prerequisite: Two years of a foreign language or equivalent; consent of instructor. 3 hours or 3/4 unit.
 389. **Theoretical Foundations of TESL Methodology.** Same as Linguistics 389. Applied linguistics in teaching and learning English as a second language with special emphasis on the applications of some principles of psycholinguistics, sociolinguistics, and ethnolinguistics along with the related disciplines of education,

- psychology, and anthropology to structured teaching and learning situations. Prerequisite: Consent of instructor. 3 hours or 3/4 unit.
400. **Verbal Communication in English as a Second Language for Graduate Foreign Students, I.** Language laboratory course concentrating on the typical writing problems that a graduate or research student encounters in an American university. Prerequisite: Graduate standing and English as a Second Language 111, or consent of instructor. 0 to 4 hours. No graduate credit.
401. **Verbal Communication in English as a Second Language for Graduate Foreign Students, II.** Language laboratory course dealing with individual, immediate, and specialized speaking and writing problems, with particular attention to orienting graduate or research students to the techniques of the American university in thesis and other specialized writing, and in the oral presentation of such material. Prerequisite: Graduate standing and English as a Second Language 400, or consent of instructor. 0 to 4 hours. No graduate credit.
402. **Introduction to General Linguistics.** Same as Anthropology and Linguistics 400. See Linguistics 400.
410. **Generative Phonology in English Teaching.** Generative phonological analyses of English and the teaching of English pronunciation: reevaluation of teaching goals, content, presentation, and methodology; required projects involve developing and evaluating lesson materials and observing and participating in teaching generative materials in ESL classes. Prerequisite: English as a Second Language 301 and English as a Second Language 388. 1 unit.
412. **Pedagogical Grammar.** Surveys English grammar and texts for teaching grammar in ESL, with special emphasis on the development of skills in explanation of grammatical phenomena in ESL classes. Prerequisite: English as a Second Language 302 or equivalent. 3/4 unit.
419. **Contrastive Linguistics.** Same as Linguistics 419. See Linguistics 419.
460. **Research Methods in Language Learning.** Seminar focusing on the formulation of language learning and teaching issues as research questions. Specific topics include: types of research problems, research designs, methods, and strategies; and the analysis, interpretation, and reporting of research findings. Discusses illustrative research and evaluation studies. Students participate in seminar presentations and develop a research proposal. Prerequisite: English as a Second Language 360 or consent of instructor, and English as a Second Language 389. 3/4 unit.
463. **College Teaching of Foreign Languages.** Same as French, Russian, German, and Spanish 463. See French 463.
481. **Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as French, German, Russian, and Spanish 481. See French 481.
487. **Seminar in the Teaching of English as a Second Language.** Discussion of and research into various topics of current interest to persons involved in teaching English as a second language; emphasis on new approaches to problems facing the field and the development of understanding methods; study of materials leading to possible solutions. May be repeated as the topic changes. Prerequisite: English as a Second Language 388 or 302, or consent of instructor. 1/2 to 1 unit.
491. **Research in Special Topics.** Independent study under guidance of a member of the graduate faculty. Prerequisite: Consent of instructor. 1/4 to 1 unit. May be repeated for a total of 2 units.
499. **Thesis Research.** Individual direction of research and thesis writing. Prerequisite: Consent of thesis supervisor. 0 to 2 units. May be repeated to a maximum of 2 units

ENTOMOLOGY

Head of Department: Professor S. Friedman

Department Office: 320 Morrill Hall, 505 S. Goodwin, Urbana

101. **Introduction to Applied Entomology.** Lectures, laboratory, and field practice in the recognition and management of important insect pests of agricultural, forest, and urban ecosystems: classification, structure, and physiology; life histories and behavior involved with injury; and methods of control. 3 hours.
103. **Life of Insects.** Nontechnical course in which the main ideas of biology are explored using insects as examples; treats insect structure and its function, insect evolution, behavior, and sociality, role of insects in the natural world, impact of insects on man, and insect control. Laboratory provides practical examples of lecture principles. 3 hours. Students may not receive credit for both Entomology 103 and 118.
118. **Insects, Man, and Environment.** Nontechnical course which considers basic aspects of entomology and ecology, especially as they relate to problems in the use of pesticides and environmental pollution. 3 hours. Credit is not given for both Entomology 118 and 103.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
290. **Special Problems.** For students ready to undertake special investigation to be completed as an undergraduate study or as the beginning of a thesis problem for an advanced degree. It also may be used to prepare a thesis for scholastic honors. Prerequisite: Consent of instructor. May be taken by students who can only attend classes on Saturday morning. 2 to 5 hours.
301. **Introduction to Entomology.** Integrated studies of the principal morphological, physiological, and ecological relationships among insects. Tutorials, field experience, and/or insect collections will be required for 4 or 5 hours, or 1 unit credit. Prerequisite: Biology 111 and Chemistry 131. 3 to 5 hours, or 3/4 to 1 unit.
302. **Classification and Evolutionary History of Insects.** Analytical survey of the classification and evolution of the orders and principal families of insects, with practical experience in the identification of insects at these taxonomic levels; field trips required. Prerequisite: Entomology 301 or concurrent registration in Entomology 410; consent of instructor. 4 hours or 1 unit.
303. **Insects and the Processes of Evolution.** Origin of adaptations and formation of species in insects; topics include evolution of insecticide resistance, coadaptation, and speciation in parasitic and phytophagous insects. Prerequisite: Biology 210 or equivalent, or consent of instructor. 3 hours or 3/4 unit.
312. **Entomology for Teachers.** Recognition of the chief orders of insects in their immature and adult stages, including their development, life cycles, and interrelationships with the environment; students will prepare collections; field trips, laboratory, and discussion. Prerequisite: One year of biology, botany, zoology, or equivalent. 3 or 5 hours, or 1/2 or 1 unit. Offered in the summer session only.
315. **Insect Ecology.** Discussion of the practical and theoretical aspects of ecology in relation to insects as individuals, populations, and communities; emphasis on the role of insects in the environment. Prerequisite: Ecology, Ethology, and Evolution 212 or consent of instructor. 4 hours or 1 unit.
316. **Field Entomology.** Familiarity with insects in the field, ecological relationships, and methods of study are gained through field trips and team and individual projects involving practical and library work. Saturday field trips required. Prerequisite: Credit or concurrent registration in Entomology 315; Entomology 302; Botany 260 or equivalent; a course in statistics; consent of instructor. 2 hours or 1/2 unit.
319. **Fundamentals of Insect Pest Management.** Study of the principles underlying the control of important insect pests of agriculture and of human and animal health; emphasis on integrated pest management involving a systems approach which combines biological, cultural, and chemical suppressive factors into ecologically sound

- and socially and economically acceptable technology. Prerequisite: Entomology 101, or 301 and 302, or consent of department. 4 hours or 1 unit.
323. **Invertebrate Chemical Communication.** Physiological and chemical aspects of invertebrate communication with emphasis on insects; laboratory experience consisting of methods employed in such studies. Prerequisite: Chemistry 136, Entomology 301 or Ecology, Ethology, and Evolution 320, and consent of instructor. 4 hours or 1 unit.
410. **Insect Morphology.** Comprehensive study of internal and external structures of insects from the comparative viewpoint. Prerequisite: Biology 111 or equivalent; consent of instructor. 1 unit.
413. **Medical and Veterinary Entomology.** Training in recognition, classification, methods of injury, habits, and control or destruction of insects, mites, and ticks which are predators, parasites, or disseminators of disease among men and domestic animals. Prerequisite: Entomology 103 or 302, or Ecology, Ethology, and Evolution 320; consent of instructor. 1 unit.
420. **Chemistry and Toxicology of Insecticides.** Designed to provide fundamental information concerning the mode of action, the relationship of chemical structure to toxicity, and the physiological explanation of the chemical poisoning of insects. Prerequisite: One year of biology or equivalent in animal science; organic chemistry; consent of instructor. 1 unit.
422. **Insect Physiology.** Study of principal physiological and biochemical functions of insects, exclusive of sensory functions. Prerequisite: Entomology 301 or equivalent, organic chemistry, and consent of instructor. 1 unit.
426. **Seminar in Entomology.** Discussions, reviews, and appraisals of special topics in the field of entomology. Prerequisite: Consent of instructor. 0 or 1/4 unit. May be repeated for a maximum of 1 unit.
490. **Individual Topics.** Individual topics in research and/or reading conducted under the supervision of faculty members in the Department of Entomology; particularly designed for students enrolled in the entomology programs who would like to become more familiar with specialized fields of study prior to committing themselves to a specific area for their doctorate degree. Prerequisite: Consent of instructor. 1/4 to 2 units. May be repeated.
499. **Thesis Research.** Work may be taken in the following subjects: morphology and embryology of insects; applied entomology; systematic entomology; biology and ecology of insects; insect toxicology; and insect physiology. 0 to 4 units

ENVIRONMENTAL STUDIES

Director of Institute: Professor B. B. Ewing

Institute Office: 408 South Goodwin Avenue, Urbana

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
236. **Tomorrow's Environment.** Same as Health Education 236. Introduction to interdisciplinary methods of analysis of environmental problems in a finite world; examination of the concepts of the limits to growth; development of a working understanding of natural systems and environmental economics; and examination of various management strategies (technical, economic, and social) that can be used to improve environmental quality. Prerequisite: One course in the life sciences and one course in the social sciences, or consent of instructor. 3 hours.
241. **Introduction to Radiation Protection.** Same as Nuclear Engineering 241. See Nuclear Engineering 241.
283. **Introductory Ecology for Educators.** Same as Forestry 283. Intended primarily for education students. Basic ecological concepts and how they may be incorporated into the classroom; includes ecosystem structure and function, communities and population, energy flow and nutrient cycling, and integrating ecology/environmental

education into the classroom. Eight-hour field trip required; see Timetable for approximate cost. 3 hours.

299. **Individual Studies of Environmental Topics.** Individual studies of environmental problems and their solutions. Studies are accomplished under the immediate supervision of faculty of the Institute for Environmental Studies. Prerequisite: Consent of instructor. 0 to 4 hours.
316. **Economic Analysis for Urban Environmental Problems and Policies.** Same as Urban Planning 346. Application of microeconomic analysis to the problem of environmental management and planning in urban areas; emphasizes the interface between economics and other disciplines, e.g., medicine, epidemiology, engineering, and law, in designing and evaluating alternative strategies for controlling pollution from industrial and transportation-related activities. Prerequisite: Urban and Regional Planning 477, Economics 300 or consent of instructor. 3 hours, or 3/4 or 1 unit.
319. **Environment and Plant Ecosystems.** Same as Agronomy and Forestry 319. See Agronomy 319.
331. **Toxic Substances in the Environment.** Explores toxicological, public health, environmental, industrial, economic, and legal aspects of the use and release of toxic substances in the environment; emphasizes biochemical toxicology and epidemiological aspects of environmental pollution; and features case histories of environmental toxicants. Prerequisite: One year of college chemistry or consent of instructor. 2 hours or 1/2 unit.
341. **Air Resources Management.** Same as Civil Engineering 341. See Civil Engineering 341.
374. **General Epidemiology.** Same as Health Education, Medical Sciences, and Veterinary Pathobiology 374. See Health Education 374.
393. **Environmental Quality Management.** Same as Urban Planning 343. Issues and concepts used in determining the desired level of environmental quality, with emphasis on pollution control; comparisons of management alternatives with emphasis on equity, cost, and ease of administration; and includes the study of an actual pollution management problem. Designed for students with an environmental or public policy analysis background. Prerequisite: Senior or graduate standing; calculus or consent of instructor. 3 hours or 3/4 unit.
397. **Selected Environmental Problems.** Advanced study of problems related to the environment. Each unit of instruction focuses on a coherent problem area centered primarily within the subject matter of one or more interrelated disciplines comprising the Institute and taught by one or more faculty members from these disciplines. Prerequisite: Senior or graduate standing and consent of instructor. 1 to 4 hours, or 1/4 to 1 unit.
463. **Natural Resource Economics.** Same as Agricultural Economics, Economics, and Forestry 463. See Agricultural Economics 463.
464. **Environmental Economics: Theory and Applications.** Same as Agricultural Economics and Economics 464. See Economics 464.
495. **Environmental Studies Seminar.** Interdisciplinary seminar on topics of current interest. Students, faculty, and visiting lecturers present seminars based upon their study, research, and/or professional activities in the selected environmental topic area. Prerequisite: Consent of instructor. 0 to 1 unit. May be repeated as topic varies.
497. **Studies of Environmental Topics.** Individual or group research and study of environmental topics. Subjects for individual study, selected by the student, must be approved by the student's adviser and by the Director of the Institute. (Note: This is not a thesis research course.) Group study focuses on environmental problems and their solutions. Prerequisite: Consent of instructor. 0 to 4 units. May be repeated

FAMILY AND CONSUMER ECONOMICS

Head of Department: Professor F. M. Magrabi

Department Office: 271 Bevier Hall, 905 S. Goodwin, Urbana

170. **Consumer Economics.** Introduction to the study of the consumer in the American economy; sources of consumer information and consumer protection; and examination of current consumer issues within an economic framework. 3 hours.
175. **Energy in the Home.** Examines household energy use emphasizing energy sources and patterns of energy use in the home; studies the effect of energy supply on life styles, national policies, and the management of energy use by families and society. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
270. **Family Financial Management.** Examines principles of family financial resource management with attention given to research findings on the interdependence of financial decisions and energy, time, and other resources used to attain family goals and maintain family values. Prerequisite: Junior standing and Economics 101, or consent of instructor. 3 hours.
273. **Home Management Seminar.** A seminar course emphasizing an analytical and applied approach to the study of managerial behavior of families, especially low income families. Two all-day field trips; see Timetable for approximate cost. Prerequisite: Family and Consumer Economics 270 and consent of instructor. 4 hours.
291. **Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
292. **Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
313. **Economics of Consumption.** Same as Economics 313. Analysis of the macro and micro aspects of consumption. Prerequisite: Economics 101 or equivalent; a course in applied statistics; junior standing. 3 hours, or 3/4 or 1 unit.
361. **Development and Function of Family Housing.** Same as Agricultural Mechanization and Interior Design 361. See Agricultural Mechanization 361.
370. **Family Economics.** Same as Agricultural Economics 370, and Economics 346. Examines the economic welfare of American families: application of economic theory to the behavior of families and individuals with respect to time allocation between the home and the market; family forms; human capital accumulation; sex differences in income; income adequacy; and poverty. Considers the role of public policy. Prerequisite: Economics 101 or equivalent; a course in applied statistics; senior standing. 3 hours, or 1/2 to 1 unit. Students in family and consumer economics may receive 1 unit credit; students in agricultural economics may receive 3/4 unit credit; and students in economics may receive 1/2 unit credit.
371. **The Family as a Consuming Unit.** Analyzes the contributions of economics, sociology, psychology, anthropology, and areas in home economics to understanding the role of the family as a consuming unit; deals with the three aspects of consumer activities (choice making, buying, and using). Prerequisite: Six hours of social science. 3 hours, or 3/4 or 1 unit.
375. **Home Equipment.** Principles related to the selection, use, and care of household equipment; individual problems include library research of sources of information on equipment and laboratory evaluation of equipment. Prerequisite: Foods and Nutrition 231, Family and Consumer Economics 273, or Textiles and Clothing 380. 3 hours, or 3/4 or 1 unit.
378. **Problems in Home Management and Housing.** Individual investigations and reports of specific problems in the fields of home management or housing. Prerequisite: Family and Consumer Economics 270; senior standing; consent of instructor. 3 hours, or 3/4 or 1 unit.
379. **Problems in Family, Consumer, and Consumption Economics.** Individual investigations and reports of specific problems in the field of family and consumption

economics. Prerequisite: Economics 101 or equivalent; a course in applied statistics; Family and Consumer Economics 313, 370, 371, or consent of instructor; senior standing. 3 hours, or 1/2 or 1 unit.

- 470. **Seminar in Family and Consumption Economics.** Same as Agricultural Economics 470. Discussion of current topics and review of the literature in family and consumption economics. Prerequisite: Economics 101 or equivalent; a course in applied statistics; Family and Consumer Economics 313 or 370, or consent of instructor. 1/2 or 1 unit.
- 472. **Economics of the Family.** Discusses and analyzes advanced literature on the economics of the family, developed within the models of human capital and allocation of time; emphasizes the theory and empirical applications. Prerequisite: Economics 400 or 402; Economics 470 or Sociology 385, or equivalent. 1 unit.
- 493. **Advanced Studies in Family and Consumer Economics.** Library or experimental research on specific problems of limited scope. May be taken in addition to 8 units required for a master's degree by students who do not write a thesis. 1/2 or 1 unit.
- 499. **Thesis Research.** 0 to 4 units

FINANCE

Chairperson of Department: Professor Charles M. Linke

Department Office: 340 Commerce Building (West), 1206 South Sixth, Champaign

- 150. **Money, Credit, and Banking.** Study of monetary and banking systems and the impact of monetary policy on employment, prices, economic growth, and international trade. Prerequisite: Economics 101 or equivalent. 3 hours.
- 199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 231. **Investment Principles.** Financial investment as promoter of economic productivity; securities: government, corporate, and mutual fund; securities markets: exchanges, brokers, and dealers; investment decisions in theory and practice; elements of security analysis and portfolio management; and the special case of mutual funds and their shares. For non-commerce majors. Prerequisite: Economics 101 or equivalent. 3 hours. Commerce students and LAS finance majors may not receive credit towards graduation for this course. Credit is not given for both Finance 231 and 235.
- 235. **Investment Analysis.** The investment environment; analysis of the aggregate market, industry, and the individual firm; and valuation methods, especially applications to common stocks and bonds. Prerequisite: Finance 254. 3 hours.
- 237. **Portfolio Analysis.** Examination of alternative investment instruments; conceptual foundations of portfolio theory; and methods of selecting, evaluating, and revising portfolios of assets. Prerequisite: Finance 235. 3 hours.
- 252. **Banking Practice in the United States.** Study of the functions, operations, policies, organization, management, and supervision of banks. Prerequisite: Finance 150 and 254. 3 hours.
- 254. **Introduction to Business Financial Management.** Development and study of a decision framework for financial management; an introduction to the analysis of past and future needs; an analysis of the management of short-term assets; an introduction to a decision framework for capital investment management with an analysis of the cost and sources of long-term capital; and integration of the concepts of financial management into a total systems approach to business decision making. Prerequisite: Accountancy 105 or 201; credit or concurrent registration in Economics 172. 3 hours. Credit is not given for both Finance 254 and 257.
- 258. **The Money Market and American Financial Institutions.** Study of the development and the practices of specialized financial institutions in the United States: commercial banking; central banking; savings banks; trust companies;

- investment banking; real estate finance; agricultural finance; and government financial institutions. Prerequisite: Economics 101 or equivalent. 3 hours.
260. **Economics of Insurance.** Survey course in insurance which serves as a common introductory course to the fire, marine, casualty, surety, and life branches of the insurance business. Prerequisite: Economics 101 or equivalent. 3 hours.
262. **Life Insurance.** Study of the life insurance industry, companies, products, and markets. Prerequisite: Economics 101 or equivalent. 3 hours.
280. **Advanced Financial Management.** Integration of the capital investment, long-run financing working-capital decision processes; use of simulation, cases, and other techniques to study each decision process. Prerequisite: Finance 254. 3 hours.
281. **Short-Run Financial Management.** Introduces short-run financial planning and integrates it into the capital investment model; uses cases and simulation to study fund-flow analysis and the management of liquidity, receivables, inventory, payables, and operating leverage. Prerequisite: Finance 254. 3 hours.
294. **Senior Research.** Research and reading course for students concentrating in finance, insurance, urban land economics, or related areas who meet one of the following requirements: (1) have a cumulative grade-point average of 4.0 or better; (2) have attained Honors Day recognition in the junior year; or (3) have consent of instructor. May be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Senior standing. 2 to 4 hours.
295. **Senior Research.** Research and reading course for students concentrating in finance, insurance, urban land economics, or related areas who meet one of the following requirements: (1) have a cumulative grade-point average of 4.0 or better; (2) have attained Honors Day recognition in the junior year; or (3) have consent of instructor. May be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Senior standing. 2 to 4 hours.
354. **Multinational Business Finance.** Development and study of a framework for the financial decisions of multinational businesses; includes the management of working capital, investment and financing decisions of the firm in an international environment, foreign exchange markets, exchange risk, and international diversification. Prerequisite: Finance 254 and Economics 328. 3 hours or 1/2 or 1 unit.
357. **Financing Small Business.** Size and nature of small business; significance and limitations of small business; financial structure and problems; financial assistance to small business; and future prospects of small business. Prerequisite: Finance 254 or 257. 3 hours, or 1/2 or 1 unit.
360. **Employee Benefit Plans.** Same as Labor and Industrial Relations 360. Analysis of the economic and financial issues involved in designing and administering employee benefit plans; major emphasis on group life, disability income, and medical care plans, and on qualified pensions and profit-sharing plans for regular employees; and some attention to special supplementary plans for the executive employees. Prerequisite: Finance 260, Economics 240, or Business Administration 351, or consent of instructor. 3 hours, or 1/2 to 1 unit.
363. **Seminar in Life and Health Insurance.** Seminar devoted to discussions of current financial, legal, and social problems involving life and health insurance; discussion of legal and financial problems involving life and health insurance product development, life and health insurance in estate planning, government regulation of the life insurance industry, and the economic aspects of the industry. 3 hours, or 1/2 to 1 unit.
364. **Fundamentals of Real Estate.** Surveys real estate finance, appraisal, investment brokerage, and management; gives special attention to the analysis of aggregate real estate and mortgage markets to the individual transactions of which the markets are composed and to the legal and institutional factors which have an impact on these markets. Prerequisite: Economics 101 or equivalent. 3 hours.
365. **Urban Land Investment Analysis.** Provides an analysis on framework for urban real estate investment decisions by individuals and institutions; exposition of rate-of-return analysis illustrated by actual investment situations. The determinants

- of real estate investment policy for borrowers and lenders require consideration of mortgage markets, government policies, risk controls, and analysis of different types of real estate investments. Prerequisite: Finance 364 or consent of instructor. 3 hours, or 1/2 to 1 unit.
366. **Valuation Theory and Methods.** Concentration on land value theory and methods; primary concern on the selection of a valuation theory which produces an ethical valuation as needed by buyers, sellers, lenders, the government, insurers, etc.; examination of the role of the appraiser as evaluator, expert witness, and counselor; and use of case method to demonstrate principles and practices. Prerequisite: Finance 364 or consent of instructor. 3 hours, or 1/2 to 1 unit.
367. **Urban Economics.** Same as Economics 361. See Economics 361.
370. **Risks and Risk Management.** Analysis of the financial problems in the risks of property damage or bodily injury (in business situations), and evaluation of the alternative methods for dealing with such problems. Prerequisite: One of the following: Accountancy 105 or 201, or Finance 254 or 257; Economics 101 or equivalent. 3 hours, or 1/2 to 1 unit.
371. **Seminar in Property and Liability Insurance.** Seminar devoted to discussions of current financial, legal, and social problems involving property-liability insurance; analysis of legal problems involving insurance coverages, financial aspects, and governmental regulation of the property-liability insurance enterprise, and economic aspects of the insurance industry. 3 hours, or 1/2 to 1 unit.
420. **Central Banking Policy.** Examination of modern theories of monetary management, gold standard theories, central banking, fiscal policy, debt management, and their relation to monetary policy. 1 unit.
425. **The Money Market and Financial Stabilization.** Study of interest rate determination; the structure and operations of the money and capital markets; and the objectives and implementation of monetary, fiscal, and debt management policies. Prerequisite: Finance 150. 1 unit.
427. **Research Seminar in Banking.** Research reported and explored in areas of commercial bank models and behavior, bank structure and regulation, and central bank control; current topics, specialized areas in banking, and research procedures are discussed by instructor, students, and guest lecturers. Prerequisite: One semester of graduate economic theory; Economics 470. 1 unit.
452. **Long-Term Financial Decision Making.** Same as Business Administration 452. An analytical approach to the theoretical and applied aspects of decision making in business finance; assumes a long-term planning horizon; and emphasizes valuation and cost of capital theories, capital investment decisions, risk analysis, and capital structure and dividend policies. Prerequisite: Finance 254 or Business Administration 451, or equivalent; Economics 470, Business Administration 472, or concurrent registration in either course. 1 unit.
453. **Working Capital Management.** Same as Business Administration 453. A study of working capital management processes and of theoretical linkages between working capital and long-run financial management; uses a variety of models to study the theory of working capital management and to analyze relationships among variables in the short-run financial decision-making process; and combines theory and applications to provide insight into the total financial decision-making process. Prerequisite: Finance 254 or Business Administration 451, or equivalent; Economics 470, Business Administration 472, or concurrent registration in either course. 1 unit.
454. **Corporation Finance.** Nature of corporation finance and its relation to economics, accounting, and law; development of business corporation; concepts of capital, capitalization and capital stock; nature of equities in corporation; financial analysis and interpretation; nature and development of financial plans; corporate securities and their adaptation to financial plan; initial and promotional financing; current capital financing; income administration; and refinancing. Prerequisite: Finance 254. 1 unit.
455. **Seminar in Finance.** Philosophy of research; critical evaluation of selected research; emphasis on empirical studies; evaluation of analytical methods employed;

- relation of research questions to research methods; and development of thesis research topics. Prerequisite: Finance 453 or 458. 1 unit.
- 456. Investment.** Same as Business Administration 456. Introduction to investment analysis, including the functioning of capital markets, changes in markets, and analysis and tests of the efficient markets hypothesis; introduction to portfolio theory; and consideration of valuation theory applied to the aggregate market, alternative industries, and individual firms. Prerequisite: Business Administration 451 or equivalent. 1 unit.
- 457. Security Analysis.** Same as Business Administration 457. Valuation and forecasting techniques are considered and then used in the detailed analysis of the aggregate stock market, alternative industries, and individual companies and their stocks; basic principles of bond analysis and their application to corporate, government, and municipal bonds. Prerequisite: Finance/Business Administration 456. 1 unit.
- 458. Portfolio Management.** Same as Business Administration 458. Conceptual foundations and implementation of strategies for the selection, evaluation, and revision of portfolios of financial assets; examination of research related to portfolio and capital market theory. Prerequisite: Finance/Business Administration 456. 1 unit.
- 460. Theory of Insurance.** Study of the nature and cost of risk in our economic society, and of the methods of handling it. 1 unit.
- 468. Studies in Urban Economics: Environment and Land Use.** Economic forces and policies affecting location, growth, and economic base of the city; consideration of problems affecting urban resource allocation and location: housing, transportation, ecology, segregation, public finance, and strategies in community development; and consideration of theories and methods of analysis of effective urban resource allocation and valuation. Graduate students should consult with the instructor as to whether Finance 364 or this course is preferable. 1 unit.
- 469. Problems and Policies in Urban Economics.** Urban development and the national economy; interaction of business institutions and public agencies in performance of urban functions; determinants of land-use patterns; economic aspects of property rights and land-use controls; and unmet needs. Students undertake intensive analysis problem selected for individual study; cooperation with urban planning, architecture, landscape architecture, and other departments. Prerequisite: Finance 364 or 468, or consent of instructor. 1 unit.
- 470. Risk Management and Control.** Same as Business Administration 455. Analysis of the risk management problem in the business enterprise with emphasis on methodology for risk analyses; techniques for risk and loss control; models for risk management decision making; and procedures for administering risk management policy relating to nonspeculative (insurable) risk. Prerequisite: Finance 452 and Business Administration 460, or equivalent, or consent of instructor. 1 unit.
- 490. Individual Study and Research.** Directed reading and research. 1/2 to 1 unit.
- 499. Thesis Research.** Required for those writing master's and doctoral theses in finance. 0 to 4 units

FINE AND APPLIED ARTS

Program Administrator: Professor J. H. McKenzie

Program Office: 110 Architecture Building, 608 E. Lorado Taft Drive, Urbana

- 185. Kabuki.** Same as Asian Studies 185. Combines academic studies in the Japanese and Asian theatre arts and the actual production of a Japanese classic kabuki play or some other Asian theatre art form; includes all the essential elements of the theatrical arts. 2 hours. May be repeated once with consent of instructor.

190. **Exploring the Arts.** An introduction to the fine arts through lecture-discussions with a teacher-practitioner in each of the arts and through written critiques of exhibits, concerts, and plays; provides creative experiences by a final individual or small group project. 2 or 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
250. **Arts and Leisure.** A theoretical and basic approach to the application of the visual and performing arts to leisure services, parks and recreation, and therapeutic recreation centers. Prerequisite: Major in leisure studies or consent of instructor. 3 hours.
260. **Arts Management for the Individual.** Basic survival skills and strategies for visual, performing, and literary artists; topics include grantsmanship, publicity, contracts, copyright, taxes, basic recordkeeping, and career options; and practical solutions to nonartistic problems faced by artists. Requires research and written projects. Prerequisite: Consent of instructor. 3 hours.
299. **FAA Study Abroad.** Provides campus credit for foreign study and/or travel. A detailed proposal for study abroad must be submitted for approval by the appropriate committee of the department in which the student is studying and the college dean's office prior to such study abroad. Final determination of credit and its application toward the degree is made after a review of the student's work abroad by the above committee and college office. Prerequisite: Junior standing in the department; approval of the student's proposal by the departmental committee and the college office. 0 to 12 hours (summer session, 0 to 6 hours).
340. **Musical Theatre, I.** Performance experience in creation of scenes from traditional music repertoire, the staging and performance of revues, dramatization of poetry, and stylized movement based on dramatic motivation; content areas include improvisation, ensemble singing, physical conditioning, musical theory, private vocal coaching, and master classes in voice, dance, acting, and mime. Prerequisite: Audition and approval of course instructors. 4 hours or 1 unit.
341. **Musical Theatre, II.** Performance experience in operetta and musical repertoire, emphasizing the new shows of Stephen Sondheim. Includes private vocal and interpretation coaching; study of scat, belt, and operetta styles; choreography for opera and musicals; and advanced acting, mime, and unarmed combat. Prerequisite: Fine and Applied Arts 340 or audition and consent of instructors. 4 hours or 1 unit

FOOD SCIENCE

Head of Department: Professor A. J. Siedler

Department Office: 567 Bevier Hall, 905 S. Goodwin, Urbana

101. **Food in Modern Society.** Emphasis on the importance of food in providing adequate nutrients for modern society; introduction to processing and preservation of foods as well as the historical, geographical, chemical, and microbiological ramifications which exist in the food industry. 3 hours.
202. **Sensory Evaluation of Foods.** The physiology, psychology, and chemistry of flavor and flavor perception; tactual, visual, and auditory components affecting food acceptability; principles and application of preference and discrimination testing; and interpretation of panel evaluation data. 3 hours.
206. **Field Trip.** Inspection of typical food preservation and manufacturing plants. Four-day trip required of all seniors in food science and food industry; see Timetable for current fees. Prerequisite: Junior standing in food science or consent of instructor. 1 hour.
213. **Food Analysis, I.** Principles and application of the chemical, physical, and instrumental methods used to determine the constituents of foods; special considerations applicable to the analysis of certain foods. Lecture and lab. Prerequisite: Chemistry 102. 4 hours.

- 214. Survey of Food Chemistry.** Chemical composition of foods and the chemistry of the processing of meats, vegetables, fruits, milk, and cereals. Credit is not given for both Food Science 214 and 314. Prerequisite: Chemistry 102. 3 hours.
- 260. Raw Materials for Processing.** Lectures, reference readings, and laboratory experiments concerning the problems involved with procurement, harvesting, handling, and storage of fruits, vegetables, cereal grains, dairy products, and meat for the food-processing industry. Field trips to specialized operations. Prerequisite: One course in biological science and Food Science 101, or consent of instructor. 4 hours.
- 300. Special Problems.** Supervised research on special problems in food science. Prerequisite: Written consent of instructor must be obtained prior to enrollment. Not open to undergraduates who are on probation. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department subject to approval of the instructor. 1 to 5 hours, or 3/4 to 1 1/2 units. May be repeated to a maximum of 2 units.
- 301. Food Processing, I.** Principles and applications of food preservation and processing by heat, low temperatures, and mechanical operations; lecture, laboratory, and field trips. Prerequisite: Food Science 213, 260, and 363, or consent of instructor. 5 hours or 1 1/4 unit.
- 302. Food Processing, II.** Principles and applications of food preservation and processing by moisture removal, fermentation, and special operations; lecture, laboratory, and field trips. Prerequisite: Food Science 301 or consent of instructor. 5 hours or 1 1/4 units.
- 313. Food Analysis, II.** Laboratory exercises, demonstrations, and assigned readings dealing with the application of analytical chemical and instrumental techniques to the analysis of food constituents. Prerequisite: Food Science 213 or equivalent, such as quantitative analysis. 4 hours or 1 unit.
- 314. Food Chemistry and Nutrition, I.** Examines the chemical aspects of major food components: water, carbohydrates, proteins, and lipids; properties of pigments, salts, and food dispersions. Prerequisite: Chemistry 131 and 134. 4 hours or 1 unit. Credit is not given for both Food Science 214 and 314.
- 315. Food Chemistry and Nutrition, II.** Examines metabolism and nutritional aspects of carbohydrates, proteins, lipids, vitamins, minerals, food additives and toxicants of food; studies chemical changes that occur in these food components during processing and storage and their effects upon nutritional quality. Prerequisite: Food Science 214 or 315, and Chemistry 131 and 134; or equivalent. 4 hours or 1 unit.
- 324. Biochemical Aspects of Human Nutrition.** Same as Foods and Nutrition 324 and Nutritional Sciences 324. Advanced treatment of human nutrition, with emphasis on the biochemical functions of nutrients essential for man. Prerequisite: Biochemistry 350 or both Biochemistry 352 and 353, and a course in nutrition; or consent of instructor. 3 hours or 3/4 unit.
- 332. Principles of Sanitation in the Processing and Handling of Foods.** Study of the principles of sanitation with appropriate emphasis on practical considerations as they apply to various food-processing industries; control of insects, rodents, and micro organisms; fundamentals of detergency; sanitation of water supplies; waste disposal methods; and government and public health regulations. Field trips to local food-processing plants. Prerequisite: Microbiology 100 and 101; Chemistry 102. 2 hours or 1/2 unit.
- 340. Introduction to Applied Statistics.** Same as Agricultural Engineering, Agronomy, Animal Science, Dairy Science, Forestry and Horticulture 340. See Agronomy 340.
- 363. Engineering for Food Processing.** Fundamentals of material and energy balances, thermodynamics, fluid flow, heat transfer, psychrometry, refrigeration, and process control for the food process industry. Prerequisite: Introductory courses in physics and calculus, or consent of instructor. 3 hours or 3/4 unit.
- 401. Physical Chemical and Colloidal Phenomena of Food Products.** Study of physical, chemical, and colloidal phenomena involved in the processing of food products

- including such topics as food emulsion, foams, gelation, coagulation, rheology, and membrane phenomena in foods. Prerequisite: Chemistry 340. 1 unit.
402. **Advanced Topics in Food Processing.** Study of selected topics in food processing and engineering; includes extensive treatment of special processing techniques and elucidation of theory with laboratory exercises. Lecture and laboratory. Student may register only once for a given topic. Prerequisite: Food Science 302 or equivalent. 1/4 to 1 unit.
406. **State and Metabolism of Lipids.** Advanced study of the state of lipids in animal tissues and in biological fluids, and of the metabolism of lipids in relation to dietary fats and other food constituents. Prerequisite: Biochemistry 350 or consent of instructor. 1 unit.
410. **Current Topics in Nutritional Research.** Same as Dairy Science and Nutritional Sciences 410. See Nutritional Sciences 410.
411. **Chemistry of Nutritional Processes.** Same as Dairy Science and Nutritional Sciences 411. See Nutritional Sciences 411.
421. **Seminar.** Discussions on specialized topics and current literature relating to food technology. Required of all graduate students in food science. 0 or 1/4 unit.
473. **Advanced Food Microbiology.** Detailed examination of food and industrial processes dependent on fermentation and other microbial activities. Offered in alternate years. Prerequisite: Organic chemistry, calculus, and Microbiology 311. 3/4 unit.
481. **Advanced Special Problems in Food Science.** Supervised individual study on advanced special problems in food science. Prerequisite: Written consent of instructor must be obtained prior to enrollment. 1/2 to 2 units (summer session: 1/2 to 1 unit).
491. **Chemistry of Lipids in Foods.** Detailed examination of the chemical and physical properties of lipids in foods. Offered in alternate years. Prerequisite: Food Science 314 or consent of instructor. 3/4 unit.
499. **Thesis Research.** 0 to 4 units

FOODS AND NUTRITION

Head of Department: Professor L. R. Hackler

Department Office: 367 Bevier Hall, 905 S. Goodwin, Urbana

120. **Contemporary Nutrition.** Fundamental principles of human nutrition and their application to the selection of adequate diets; current topics of nutritional importance. 3 hours.
130. **Food Selection and Preparation.** Elementary study of foods in relation to market selection, preparation methods, and standards; comparative costs and food values; and principles of meal planning. 3 hours.
131. **Food Management.** Application of food preparation principles and techniques in the preparation of standard food products; principles of meal management and their application in the planning and preparation of meals. A laboratory fee is assessed each student. Prerequisite: Foods and Nutrition 130. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
220. **Principles of Nutrition.** Nutritive value of foods and metabolism of essential nutrients; application of principles of nutrition to the requirements of normal individuals throughout the life cycle. Prerequisite: Chemistry 102 or 103; Physiology 103. 3 hours.
231. **Science of Foods.** Fundamental composition and behavior of foods; applies chemistry and other physical sciences to principles of food preparation and preservation. Prerequisite: Chemistry 102 or equivalent; Foods and Nutrition 131. 3 hours.
240. **Quantity Food Production and Service.** Application of the principles of food preparation and service to institutional and commercial feeding. Prerequisite: Food

- handlers certificate; Economics 101; Foods and Nutrition 231; consent of instructor. 2 to 5 hours.
250. **Foods and Nutrition Internship.** Supervised learning experience through a cooperative program with a foods and nutrition related agency, business, or industry. Prerequisite: Junior standing and consent of department head; not open to students on probation. 3 hours.
291. **Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
292. **Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
305. **Pediatrics and Nutrition.** Same as Elementary and Early Childhood Education 301 and Human Development and Family Ecology 305. Basic principles of nutrition, health and disease relevant to infants and children in group settings. Presents bio-medical concepts necessary for an understanding of subject matter. Not recommended for students majoring in nutrition or related field of study. Prerequisite: 3 hours of social sciences and 6 hours of natural sciences courses. 3 hours, or 3/4 or 1 unit.
320. **Nutritional Aspects of Disease.** Application of the science of nutrition to the maintenance of optimum health and the role of nutrition in the prevention and treatment of disease. Prerequisite: Credit or concurrent registration in Foods and Nutrition 220 and Biochemistry 350. 3 hours or 3/4 unit.
321. **Experimental Nutrition.** Principles and application of nutrition research methodology, including animal feeding experiments, body composition studies, and nutrient analyses; laboratory and laboratory discussion. Prerequisite: Foods and Nutrition 220, Chemistry 122, Chemistry 134, or equivalent; and credit or concurrent registration in Biochemistry 350. 3 hours or 3/4 unit.
322. **Physical Growth and Nutrition.** Lecture, readings, and discussions. Prerequisite: Foods and Nutrition 220; senior standing; consent of instructor. 2 hours or 1/2 unit.
323. **Recent Advances in Foods and Nutrition.** New developments in foods and nutrition; readings, lectures, and discussions. Prerequisite: Chemistry 102; Foods and Nutrition 220 and 231; Physiology 103. 2 hours or 1/2 unit. Offered in summer session only.
324. **Biochemical Aspects of Human Nutrition.** Same as Food Science 324 and Nutritional Sciences 324. See Food Science 324.
325. **Problems in Experimental Nutrition.** Individualized instruction in experimental nutrition. Prerequisite: Foods and Nutrition 321, Biochemistry 350 or 352 and 353, Biochemistry 355, and consent of instructor. 1 to 5 hours, or 1/4 to 1 1/4 units.
326. **Presentations: Principles and Techniques.** Selection of problems and organization of materials for demonstrations and other presentations in human resources and family studies subject-matter areas. Field trip; see Timetable for approximate cost. Prerequisite: Senior standing; consent of instructor. 3 hours or 1/2 unit.
330. **Experimental Foods.** Consideration of the manner in which such variables as ingredients, proportions, and techniques in food preparation affect the quality of the product. Prerequisite: Foods and Nutrition 231. 3 hours, or 3/4 or 1 unit.
331. **Problems in Foods.** Individual problems in food preparation and preservation. Prerequisite: Foods and Nutrition 330. 3 hours or 3/4 unit.
345. **Institution and Restaurant Management: Food Purchasing and Equipment Selection.** Purchasing food and selecting equipment for quantity food service; factors affecting the purchase of food; and the relationship of floor plans and equipment to service. Field trip; see Timetable for approximate cost. Prerequisite: Credit or concurrent registration in Foods and Nutrition 240; Economics 101. 3 hours or 1/2 unit.
350. **Institution and Restaurant Management: Organization and Administration.** Organization and administration of food service operations; management problems in various types of food service: personnel, costs, and sanitary control. Field trips; see Timetable for approximate cost. Prerequisite: Foods and Nutrition 120 and 240. 4 hours or 1 unit.

355. **Specialized Quantity Food Production and Management.** Advanced application of food production and management principles to specific food service demands; emphasis on artistry in preparation, serving, and merchandising high quality food in quantity. Prerequisite: Foods and Nutrition 240, credit or concurrent registration in Foods and Nutrition 350, or consent of instructor. 3 hours or 3/4 unit.
422. **Seminar in Nutrition.** Study of recent literature in nutrition. Prerequisite: Undergraduate degree in human resources and family studies with emphasis on foods and nutrition, or comparable background in biochemistry, microbiology, physiology, or other biological science. 1/2 or 1 unit.
423. **Problems in Human Nutrition.** Methods of assessing nutritional status of humans. Prerequisite: Foods and Nutrition 324 or equivalent. 1/2 or 1 unit. Offered in alternate years.
432. **Seminar in Foods.** Review of current literature in foods research. Prerequisite: Undergraduate major in foods and nutrition, chemistry, microbiology, or physiology; consent of instructor. 1/2 or 1 unit.
445. **Current Topics in Food Service Systems Research.** Study of recent research related to food service systems; extensive investigation of research data and techniques on special topics each semester. Prerequisite: Graduate standing in foods and nutrition or related fields; Food Science 340; consent of instructor. 1/2 or 1 unit. May be repeated to a maximum of 1 unit.
493. **Advanced Studies in Foods and Nutrition.** Library or experimental research on specific problems of limited scope. May be taken in addition to 8 units required for a master's degree by students who do not write a thesis. 1/2 or 1 unit.
499. **Thesis Research.** 0 to 4 units

FORESTRY

Head of Department: Professor G. L. Rolfe

Department Office: 110 Mumford Hall, 1301 W. Gregory, Urbana

101. **Introduction to Forestry.** The forest as a renewable natural resource; the aims and scope of forestry; economic and social importance of forests to the nation; the principal forest regions and species; forests for timber supply, for water conservation, for recreation, and for wildlife; the principles of forest management and protection; and the development of public and private forestry in the United States. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Special Problems.** Supervised research on special problems in forestry. Prerequisite: A minimum grade-point average of 3.75; senior standing; consent of instructor and head of department. Specific approval of the associate dean is required in advance of registration for a second and/or third special problem course. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department subject to approval of the instructor. 1 to 3 hours.
201. **Wildland Recreation (Summer Field Studies).** Field study of wildland recreational resources and facilities, user characteristics and preferences, and management techniques within the multiple-use concept. Prerequisite: Competence in the courses prescribed in the first two years of the forestry curriculum. 1 hour.
211. **Forest Ecology (Summer Field Studies).** Introduction to forest ecology and the application of ecological principles in silviculture and management practices. Prerequisite: Competence in the courses prescribed in the first two years of the forestry curriculum. 2 hours.
213. **Silviculture.** The art and science of controlling forest establishment, composition, and growth that will best fulfill the objectives of the owner. Prerequisite: Forestry 211. 3 hours.

220. **Dendrology.** Taxonomy, geographical distribution, economic importance, and elementary silvics of the important forest trees in the United States and Canada. Prerequisite: Botany 100. 4 hours.
221. **Forest Measurements (Summer Field Studies).** Introduction to forest measurements, including individual tree and stand measurements, inventory methods, and determination of the growth of trees and stands; topics in surveying and aerial photogrammetry. Prerequisite: Competence in the courses prescribed in the first two years of the forestry curriculum. 2 hours.
231. **Wood Utilization, I (Summer Field Studies).** Field and classroom exercises in logging and milling, conversion of raw wood to useful products, visits to plants, and industrial aspects of wood use. Prerequisite: Competence in the courses prescribed in the first two years of the forestry curriculum. 1 hour.
232. **Wood Utilization, II.** Principles and methods of harvesting, grading, and transporting forest products; conversion of logs, bolts, and cordwood; physical-mechanical properties and defects of wood; and specifications and uses of lumber, veneer, plywoods, pulp, paper, and chemical derivatives. 3 hours.
236. **Physical Properties of Wood and Wood-Base Materials.** Physical properties of wood materials, emphasizing the influence of anatomy, density, and moisture content; wood-liquid relations; thermal, electrical, and acoustical properties; and study of the theory and practice of wood seasoning for determining dimensional stability. Prerequisite: One year of college physics and one year of college chemistry, or consent of instructor. 3 hours.
253. **Forest Economics.** Concepts of economic supply of, and demand for, the major wood products; trends in wood products consumption and prices, and the major marketing problems; and prospects for future development of U.S. wood products industries and trade. Prerequisite: Economics 101 or equivalent. 3 hours.
256. **Surveying Agricultural and Forest Lands.** Same as Agricultural Engineering 256. See Agricultural Engineering 256.
260. **Forest Land Policy and Administration.** Forest land policies and their administration with emphasis on the relations among resources, politics, and people; current major problems in forest land policy administration and progress toward their solution. Prerequisite: Economics 101 or consent of instructor. 3 hours.
271. **Wood Anatomy and Identification.** Study of the macroscopic, microscopic, and ultramicroscopic structure of wood and the identification of many important commercial woods by means of anatomical characteristics; fundamental physical and chemical properties of wood. 3 hours.
273. **Adhesives and Laminates.** Physical and chemical properties of the principal adhesives used to bond wood and other materials; principles of adhesion; and manufacture, properties, and uses of plywood, laminated wood, and other products. 3 hours.
277. **Interpretation of Aerial Photographs.** Same as Geography 277. See Geography 277.
281. **Introduction to Forest Resource Management (Summer Field Studies).** Field introduction to forest resource management, including wildlife management, watershed management, and forest protection. Prerequisite: Competence in the courses prescribed in the first two years of the forestry curriculum. 2 hours.
282. **Forest Management.** Concepts and techniques of management applied to forests for sustained production of goods and services; determination of optimum rotations and growing stock levels; and regulation of timber production and management planning. Lecture and laboratory. Prerequisite: Forestry 281 or consent of instructor. 3 hours.
283. **Introductory Ecology for Educators.** Same as Environmental Studies 283. See Environmental Studies 283.
290. **Urban Forestry.** The management of wooded areas in urban and community settings, including how trees contribute to improving the urban environment and how they react to urban stresses. Includes laboratory. Prerequisite: Forestry 220, Horticulture 202, or Landscape Architecture 252, or equivalent. 3 hours.

301. **Forest Recreation.** Same as Leisure Studies 301. The management of forest lands for recreational uses; biological and physical resources; users' behaviors, needs, and desires; and principles involved in managing the forest resource and the users. Prerequisite: Leisure Studies 100, Forestry 201, or consent of instructor. 2 hours or 1/2 unit.
304. **Forest Pathology.** Same as Plant Pathology 304. See Plant Pathology 304.
315. **Forest Soils.** Study of the physical, chemical, and biological properties of forest soils; includes the relationship of forest soils to the total environment, forest hydrology, tree growth, and stand development; weekend overnight field trip required. Prerequisite: Agronomy 101. 2 hours or 1/2 unit.
316. **Advanced Forest Ecology.** Emphasizes the relationship between environmental factors and tree growth; discusses various silvicultural and site-improvement practices in relation to their ecological basis; weekend overnight field trip required. Prerequisite: Forestry 211 or consent of instructor. 3 hours or 3/4 unit.
319. **Environment and Plant Ecosystems.** Same as Agronomy and Environmental Studies 319. See Agronomy 319.
321. **Forest Biometrics.** Introduction to statistical methods used in the management of natural resources; includes applied regression analysis and survey of sampling methods, with computer applications. Prerequisite: A course in statistics. 3 hours or 3/4 unit.
326. **Tree Physiology.** Studies of tree functions as they relate to tree structure, environment, and cultural practices; emphasizes photosynthesis, carbohydrate metabolism, nitrogen metabolism, water relations, and symbiotic associations of trees. Prerequisite: Botany 100 and Chemistry 102 or 103. 3 hours or 3/4 unit.
340. **Introduction to Applied Statistics.** Same as Agricultural Engineering, Agronomy, Animal Science, Dairy Science, Food Science and Horticulture 340. See Agronomy 340.
345. **Statistical Methods.** Same as Animal Science and Dairy Science 345. See Dairy Science 345.
348. **Wildlife and Land Management.** Same as Ecology, Ethology, and Evolution 348. See Ecology, Ethology and Evolution 348.
372. **Mechanical Properties of Wood and Wood-Base Materials.** Static mechanics, strength properties, and structural designs of wood, plywood, particleboard, and hardboard, emphasizing the standard methods of testing wood and fibrous material, wood beam and column designing, and other factors concerning the strength of wood materials, particularly the derivation of allowable stresses. Prerequisite: Physics 102. 3 hours or 3/4 unit.
377. **Aerial Photograph Interpretation and Remote Sensing.** Same as Geography 377. See Geography 377.
400. **Seminar.** Discussions on specialized topics and current literature in forestry. Required of all graduate students in forestry. 1/4 unit. May be repeated to a maximum of 1/2 unit.
401. **Special Problems.** Individual studies or investigations in selected branches of forestry. 0 to 1 unit. Not more than 2 units may be offered toward an M.S. degree.
414. **Discussions in Forest Ecology and Physiology.** Individual and group discussions of developments and techniques in forest ecology and physiology based on classic and current literature. Prerequisite: Consent of instructor. 1/4 unit. May be repeated to a maximum of 1 unit.
415. **Linear and Non-Linear Statistical Models for Biologists.** Same as Animal Science and Dairy Science 415. See Animal Science 415.
431. **Plant Cell Metabolism.** Same as Agronomy, Biology, Horticulture, and Plant Pathology 431. See Biology 431.
432. **Plant Cell Energetics.** Same as Agronomy, Biology, Horticulture, and Plant Pathology 432. See Biology 432.
433. **Environmental Regulation of Plant Growth.** Same as Agronomy, Biology, Horticulture, and Plant Pathology 433. See Biology 433.

- 434. **Regulation of Plant Development and Reproduction.** Same as Agronomy, Biology, Horticulture, and Plant Pathology 434. See Biology 434.
- 450. **Advanced Forest Biometry.** Examines and discusses developments and techniques used in forest inventory, growth models and ecological models. Offered alternate years. Prerequisite: Forestry 321, Agronomy 440, or consent of instructor. 1/2 unit.
- 460. **Discussions in Forest Policy and Administration.** Individual and group discussions of the major relevant problems in the field of forest resources policy and administration (both public and private) based on current literature. Prerequisite: Consent of instructor. 1/4 unit. May be repeated to a maximum of 1 unit.
- 463. **Natural Resource Economics.** Same as Agricultural Economics, Economics, and Environmental Studies 463. See Agricultural Economics 463.
- 499. **Thesis Research.** Research may be conducted in various phases of forestry; subject must be approved by departmental committee. 0 to 3 units

FRENCH

Head of Department: Professor P. A. Gaeng

Department Office: 2090 Foreign Languages Building, 707 South Mathews Avenue, Urbana

Students in elementary and intermediate language courses may not ordinarily register for credit in more than one course at the same semester level (e.g., 104 or 114 or 124). Approval to do so must be obtained from the department.

- 101. **Elementary Course, I.** Grammar, pronunciation, reading, composition, and conversation. For students who have had no work in French. All students are required to attend two twenty-minute laboratory sessions per week. 4 hours.
- 102. **Elementary Course, II.** Continuation of French 101. All students are required to attend two twenty-minute laboratory sessions per week. Prerequisite: French 101 or one year of high school French. 4 hours.
- 103. **Modern French.** Reading of modern authors; conversation and pronunciation; and syntax and some composition. Students planning to major or minor in French should take French 133 in lieu of French 103. Prerequisite: French 102 or equivalent, or a placement score showing high school achievement equivalent to French 102. 4 hours.
- 104. **Modern French Literature and Civilization.** Continuation of French 103. Reading of modern authors and an introduction to French civilization; some syntax and composition; and conversational practice. Completion satisfies graduation requirements in the College of Liberal Arts and Sciences. Students planning to take advanced French courses should take French 134 in lieu of French 104. Prerequisite: French 103 or equivalent, or a placement score showing high school achievement equivalent to French 103. 4 hours.
- 113. **Conversational Practice.** Oral practice for the development of elementary conversational skill and the improvement of pronunciation; designed as a supplement to third and fourth semester French courses. Prerequisite: Concurrent enrollment in third or fourth semester French course, or consent of instructor. 1 hour.
- 114. **Conversational French.** Practice in spoken French. May be substituted for French 104 to satisfy the graduation requirements in the College of Liberal Arts and Sciences; does not serve as a prerequisite for advanced courses in French without departmental approval which usually requires a proficiency examination at the 104 level. Prerequisite: French 103 or 123, or equivalent, or a placement score showing high school achievement equivalent to French 103. 4 hours.
- 121. **Elementary Reading Course, I.** Emphasizes reading comprehension for students with no previous knowledge of French; grammar, pronunciation, and translation. Should be followed by French 122. Credit is not given for both French 101 and 121. 4 hours.

- 122. Elementary Reading Course, II.** Continuation of French 121. Should be followed by French 123. Credit is not given for both French 102 and 122. Students wishing to change to another option should consult the department. Prerequisite: French 121 or appropriate placement score. 4 hours.
- 123. Readings in French Literature.** Readings in French literature (texts in French with discussion in English); some grammar essential to development of reading skill; and additional readings in English of authors treated assigned according to demonstrated interest. Serves as prerequisite to French 124; students planning to take advanced French courses should enroll in French 133. Prerequisite: French 102 or equivalent, or a placement score showing high school achievement equivalent to French 102. 4 hours.
- 124. Readings in French Literature.** Additional readings in English of authors treated will be assigned according to demonstrated interest. May be substituted for French 104 to satisfy the graduation requirements in the College of Liberal Arts and Sciences; does not serve as a prerequisite for advanced courses in French without departmental approval which usually requires a proficiency examination at the 104 level. Prerequisite: French 103; French 123; placement by virtue of high school units (usually three years). 4 hours.
- 133. Accelerated Modern French.** Same as French 103, but accelerated for those interested in pursuing French in advanced courses. Prerequisite: French 102 or two semesters of college French, or a placement score showing high school achievement equivalent to French 102. Normally for students with a "B" average in French or with consent of instructor. 4 hours.
- 134. Accelerated Modern French Literature and Civilization.** Reading of major French writers from several centuries, and introduction to French civilization, syntax and composition, and conversational practice. An accelerated course for those intending to take advanced courses in French. Prerequisite: French 133, or French 103 with department approval, or three semesters of college French, or a placement score showing high school achievement equivalent to French 103. 4 hours.
- 154. Contrastive Studies of French and American Culture.** Provocative commentaries on aspects of American life and institutions by contemporary French writers and intellectuals; some syntax, composition, and conversational practice. May be substituted for French 104 to satisfy the graduation requirements in the College of Liberal Arts and Sciences; does not serve as a prerequisite for advanced courses in French without departmental approval which usually requires a proficiency examination at the 104 level. Prerequisite: French 103 or three semesters of college French, or a placement score showing high school achievement equivalent to French 103. 4 hours.
- 191. Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Introduction to French Literature.** Prerequisite: French 104, four years of high school French, or equivalent. 3 hours.
- 202. Introduction to French Literature.** Continuation of French 201. Prerequisite: French 104, four years of high school French, or equivalent. 3 hours.
- 203. Literature and Society: A Case Study of Medieval France.** A general overview of theories about the relations between literature and society, followed by the case study of a specific and well-defined body of texts: the major works of the medieval French period and their sociohistorical context. Texts are read in modern English translation. 3 hours.
- 211. Oral French, I.** Training for the development of oral facility; exercises for the improvement of pronunciation and diction; and optional practice in the language laboratory. Prerequisite: French 104, or 103 and 113, or four years of high school French. 3 hours.

212. **Oral French, II.** Continuation of French 211; optional practice in the language laboratory. Prerequisite: French 211. 3 hours.
215. **Grammar and Composition.** Training in French syntax, translation from English into written French, and directed composition. Prerequisite: Four years of high school French or equivalent, or French 134 or, with departmental approval, French 104. 3 hours.
217. **Advanced Oral French.** Intensive practice in oral French to improve fluency, vocabulary, comprehension, pronunciation and syntax; activities include reports, discussion and role-play on topics selected and prepared by class participants; also includes weekly written assignments based on class activities. Prerequisite: French 212 or equivalent. 3 hours.
218. **Conversation dirigée.** Directed conversation stressing fluency and accuracy in French through conversations, reports, and discussions specifically centered around contemporary French life and culture. May not be used to satisfy major requirements. Prerequisite: French 217 or equivalent. 2 hours.
220. **Sixteenth-Century Literature.** General survey of the literature of the French Renaissance. Prerequisite: French 201 and 202. 3 hours.
223. **French Literature of the Seventeenth Century, I.** Major French writers of the preclassical period. Prerequisite: French 201 and 202. 3 hours.
224. **French Literature of the Seventeenth Century, II.** Major French writers of the classical period. Prerequisite: French 201 and 202. 3 hours.
227. **French Literature of the Eighteenth Century, I.** Montesquieu, Voltaire, and their contemporaries. Prerequisite: French 201 and 202. 3 hours.
228. **French Literature of the Eighteenth Century, II.** Diderot, Rousseau, and their contemporaries. Prerequisite: French 201 and 202. 3 hours.
230. **French Literature of the Nineteenth Century, I: 1800-1850.** Major prerealist and romantic writers. Prerequisite: French 202 or equivalent, or consent of instructor. 3 hours.
231. **French Literature of the Nineteenth Century, II: 1850- 1900.** The evolution of romanticism and realism into the naturalist and symbolist movements. Prerequisite: French 202 or equivalent, or consent of instructor. 3 hours.
233. **French Literature of the Contemporary Period, I.** Modern poetry from Baudelaire to Valéry; prose writers from 1900 to 1940. Prerequisite: French 201 and 202. 3 hours.
234. **French Literature of the Contemporary Period, II.** Continuation of French 233. Prerequisite: French 201 and 202. 3 hours.
255. **Introduction to French Literature in Translation, I.** Same as Comparative Literature 233. Study of selected major works of French literature from the Renaissance to the Enlightenment. Texts and lectures in English; not open to students concentrating in French. 3 hours.
256. **Introduction to French Literature in Translation, II.** Same as Comparative Literature 234. Study of selected major works of French literature from the romantic period to the present. Texts and lectures in English; not open to students concentrating in French. 3 hours.
270. **Parateaching.** Same as German, Latin, Russian, and Spanish 270. Parateaching prior to the practicum in local schools under the direct supervision of University of Illinois faculty and the teaching staff of participating schools. Prerequisite: Enrollment in a foreign language teaching curriculum or consent of an advisor in a foreign language teaching curriculum. 2 hours. May be repeated.
279. **Introduction to Foreign Language Education.** Same as German, Humanities, Latin, Russian, and Spanish 279. See Humanities 279.
280. **Teachers Course.** Survey of resources, classroom materials, standard practices, and problems in the teaching of French with practical application to actual classroom situations. Required for teacher training majors in French. This course does not meet during the period teacher-training majors are off campus. Prerequisite: French 201 and 202, and 211 and 212, and 215, or equivalent. 4 hours.

287. **French Language and Culture Through Literary Analysis, Scriptwriting, and Recording.** Deepened appreciation of French culture and advanced practical language training through reading and discussion of key works of literature and other cultural documents, followed by the writing and recording in French of scripts based on these works. Prerequisite: French 201, 211, and 215, or equivalent, or consent of instructor. 3 hours.
288. **French and Comparative Cinema, I.** Same as Comparative Literature 288. Selected world cinema trends to approximately 1960, with emphasis on French directors (Clair, Vigo, Renoir, Carne, Clouzot, etc.); aesthetic, sociopolitical, historical, literary, and technical aspects; meets six hours a week. No knowledge of French necessary. Prerequisite: For non-French concentrators, one college-level film studies course or consent of instructor; no prerequisite for French concentrators. 4 hours.
289. **French and Comparative Cinema, II.** Same as Comparative Literature 289. Continuation of French/Comparative Literature 288. Selected world cinema trends since approximately 1960, with emphasis on French directors (Chabrol, Godard, Truffaut, Resnais, Marker, Rohmer, etc); meets six hours a week. No knowledge of French necessary. Prerequisite: For non-French concentrators, one college-level film studies course or consent of instructor; no prerequisite for French concentrators. 4 hours.
290. **Individual Study: Major Tutorial.** A tutorial taken by students in the course of two of their last four semesters of undergraduate study. Students read the works on a departmental reading list with the guidance of a tutor, repeating enrollment for a total of 2 hours credit, normally at the rate of 1 hour per semester. Prerequisite: French 201, 202, 211, and 215, or equivalent; a declared field of concentration in French; junior standing. 1 to 2 hours.
292. **Senior Thesis.** For candidates for honors in French and for other seniors. Prerequisite: Senior standing. 2 hours. May be repeated for a maximum of 4 hours credit.
298. **Senior Seminar.** Studies in authors, genres, themes, and movements in French literature; conducted entirely in French. Prerequisite: Senior standing. 3 hours. May be repeated for credit.
299. **Study Abroad.** Lectures, seminars, and practical work in French language, literature, civilization, and in other academic areas appropriate to the student's course of study. Prerequisite: French 201 and two of the following: French 211, 212, or 215; 3.75 overall average; 4.0 average in French courses. 0 to 17 hours per semester, to a maximum of 34 hours per academic year.
310. **Modern African Fiction.** Same as African Studies and Comparative Literature 310 and English 370. See African Studies 310.
313. **French Phonetics and Diction.** A systematic study of the sounds and sound patterns of French; training in the improvement of French pronunciation with special attention to the problems of teachers. Prerequisite: French 212, or equivalent. 3 hours or 3/4 unit.
314. **Advanced Grammar and Style.** Advanced theoretical and practical study of present-day French, with free composition and some consideration of stylistics. Prerequisite: French 215 or equivalent. 3 hours or 3/4 unit.
316. **Structure of the French Language.** Same as Linguistics 316. General survey of the linguistic structure of modern standard French, including phonology, morphology, and syntax; emphasis on the differences between its spoken and written forms. Prerequisite: French 313 or equivalent training in phonetics. 3 hours or 3/4 unit.
319. **Techniques in Translating.** A practical course in the techniques of translating technical, commercial, scientific, and literary texts from English into French and vice versa. Prerequisite: French 314 or consent of instructor. 3 hours or 1/2 unit.
320. **Techniques in Interpreting.** A practical course in the technique of oral translation of spoken material covering a wide range of subject matter in a variety of settings. Prerequisite: French 319 or consent of instructor. 3 hours or 1/2 unit.

321. **Studies in French Literature in Translation.** Same as Comparative Literature 333. Major writers or themes of French literature studied in English translation; see Timetable for current topics. Prerequisite: Junior standing or consent of instructor. 3 hours, or 3/4 or 1 unit. May be repeated to a maximum of 6 hours or 2 units. Credit not applicable to degree programs in French.
335. **French Civilization, I.** Survey of French life and French institutions, intended as a background for literary studies and as a preparation for the teaching of French; given in French. Prerequisite: French 201, 202, 211, and 215, or equivalent. 3 hours or 3/4 unit.
336. **French Civilization, II.** Continuation of French 335. May be taken independently of French 335. Prerequisite: French 201, 202, 211, and 215, or equivalent. 3 hours or 3/4 unit.
343. **Studies in French.** See Timetable for current topics. Prerequisite: Junior standing. 3 hours, or 3/4 to 1 unit. unit.
355. **France Today, I.** Social structures of France today and their manifestation in daily life and culture; study of the workings of various institutions and systems (political judicial, economic, educational, etc.) for an understanding of current problems, providing background for closer study, in the second semester, of the forces affecting daily life. 3 hours, or 3/4 to 1 unit.
356. **France Today, II.** Study of the conditions of daily life in France today, its organization, the major forces and issues affecting it; topics include class structure, youth culture, urban and minority problems, the press, media, and popular culture and the arts. 3 hours, or 3/4 to 1 unit.
360. **Principles of Language Testing.** Same as English as a Second Language, German, and Spanish 360. See English as a Second Language 360.
362. **Introduction to Romance Linguistics.** Same as Italian, Linguistics, Portuguese, Romance Linguistics, and Spanish 362. See Spanish 362.
379. **Studies in Francophonie.** Same as Comparative Literature 334. Studies of various genres, periods, and topics of French literature outside of France, with a different geographical emphasis each semester. Regions include black Africa, the Caribbean, Canada, North Africa, the Middle East, and Switzerland. 3 hours, or 3/4 or 1 unit. May be repeated to a maximum of 12 hours or 4 units.
382. **Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as a Second Language, German, Humanities, Slavic, and Spanish 382, and Linguistics 386. See Humanities 382.
385. **Le Francais des Affaires, I.** Studies French business practices: company structures, selling and buying techniques, banking, import/export and other commercial negotiations, employment, formalities, and conventions of letter-writing; involves both theory and practice. Prerequisite: French 314 or equivalent, or consent of instructor. 3 hours or 1/2 unit.
386. **Le Francais des Affaires, II.** Emphasizes business correspondence and simulation of business practices in the areas introduced in French 385; also focuses on geographic and economic topics pertaining to France within the European community and Europe in general. Prerequisite: French 385 or equivalent, or consent of instructor. 3 hours or 1/2 unit.
399. **Study Abroad.** Lectures, seminars, and practical work in francophone literature and civilization, in a French-speaking country. Prerequisite: French 201 and 202, and two of the following: French 211, 212, and 215; or equivalent. Not open to undergraduates in the Paris program. 0 to 16 hours, or 0 to 4 units.
400. **Beginning French for Graduate Students.** Basic grammar, vocabulary, and reading practice; designed for graduate students desiring help in preparing for the French reading requirements for the Ph.D. 4 hours. No graduate credit.
401. **Reading French for Graduate Students.** Grammar, vocabulary, and general and special reading; designed for graduate students desiring help in preparing for the French reading requirements for the Ph.D. Prerequisite: French 400, or French 101 and 102, or equivalent. 4 hours. No graduate credit.

403. **The Study of Culture: Fine Arts, History, and Literature, I.** A study of major artistic, historical, political, and literary aspects of France up to the French Revolution with emphasis on the relationship between literature and other aspects of French culture. 1 unit.
404. **The Study of Culture: Fine Arts, History, and Literature, II.** Continuation of the approaches and emphases of French 403 from the French Revolution to the present. Prerequisite: French 403 or consent of instructor. 1 unit.
405. **Techniques in Teaching College and Secondary French.** Examination and discussion of classroom procedures and language laboratory techniques in teaching French at the college and secondary level, associated with demonstration class and supervision of teaching practice. Required of new teaching assistants in the Department of French. 1/2 unit.
425. **Studies in Contemporary Critical Problems.** Same as Comparative Literature 425. Introductory course to some aspect of modern French critical theory; normally taught in English and texts may be read in English. 1 hour. May be repeated as topic varies.
427. **History of the French Language.** A study of the development of the French language from Vulgar Latin to the present day. 1 unit.
430. **Introduction to Research and Textual Criticism.** Proseminar in literary studies: research and methods; approaches to the literary text. Required of all M.A. and Ph.D. candidates. 1 unit.
431. **Introduction to Old French Language.** Outline of Old French grammar and training in reading Old French (twelfth and thirteenth centuries). 1 unit.
432. **Studies in Medieval French Literature.** Close study of one or more topics in Old French literature. See Timetable for current topics. Prerequisite: French 431 or consent of instructor. 1 unit.
433. **Studies in Sixteenth-Century French Literature, I.** Major writers of the sixteenth century studied with reference to the most important intellectual and religious preoccupations of their century. 1 unit.
434. **Studies in Sixteenth-Century French Literature, II.** Themes and techniques of major poets and poetic schools of the sixteenth century. 1 unit.
435. **Studies in Seventeenth-Century French Literature, I.** 1 unit.
436. **Studies in Seventeenth-Century French Literature, II.** 1 unit.
437. **Studies in Eighteenth-Century French Literature, I.** 1 unit.
438. **Studies in Eighteenth-Century French Literature, II.** 1 unit.
439. **Studies in Nineteenth-Century French Literature.** Close study of one or more topics in nineteenth-century French literature; see Timetable for current topics. 1 unit. May be repeated to a maximum of 2 units.
441. **Studies in Twentieth-Century French Literature, I.** 1 unit.
442. **Studies in Twentieth-Century French Literature, II.** 1 unit.
443. **French Studies.** A flexible course limited only by the concentration of its material in French; may be activated by student request or faculty proposal. 1 unit.
447. **Introduction to Romance Stylistics.** Same as Italian, Portuguese and Spanish 447. See Spanish 447.
448. **Studies in French Descriptive Linguistics.** Selected specialized topics in the morphology, derivation, and syntax of contemporary standard French; topics vary each semester, e.g., verb morphology, noun derivation, interrogative systems, and nominal phrases. Prerequisite: French 316. 1 unit.
452. **Studies in French and Comparative Cinema.** Same as Comparative Literature 472. Historical, aesthetic, social, and technical studies of the French cinema; its development and relation to world cinema and to literature. 1 unit. May be repeated to a maximum of 3 units credit.
462. **Seminar in Romance Linguistics.** Same as Italian, Linguistics, Portuguese, Romance Linguistics, and Spanish 462. See Spanish 462.
463. **College Teaching of Foreign Languages.** Same as English as a Second Language, German, Russian, and Spanish 463. Rationale for curricular objectives for college courses in foreign languages; the teaching and testing of pronunciation, listening

- comprehension, speaking, reading, writing, cultural understanding, and literary appreciation; the use of technology; and recent experimentation. 1/2 or 1 unit.
470. **Seminar in Old French Literature.** Discussion and research on some specialized topic in Old French literature. See Timetable for current topic. Prerequisite: French 431 or consent of instructor. 1 unit. May be repeated for credit.
471. **Seminar in Sixteenth-Century French Literature.** Discussion and research on some specialized topic in sixteenth-century French literature. See Timetable for current topic. 1 unit. May be repeated for credit.
472. **Seminar in Seventeenth-Century French Literature.** Discussion and research on some specialized topic in seventeenth-century French literature. See Timetable for current topic. 1 unit. May be repeated for credit.
473. **Seminar in Eighteenth-Century French Literature.** Discussion and research on some specialized topic in eighteenth-century French literature. See Timetable for current topic. 1 unit. May be repeated for credit.
474. **Seminar in Nineteenth-Century French Literature.** Discussion and research on some specialized topic in nineteenth-century French literature. See Timetable for current topic. 1 unit. May be repeated for credit.
478. **Seminar in Twentieth-Century French Literature.** Same as Comparative Literature 478. Discussion and research on some specialized topic in twentieth-century French literature. See Timetable for current topic. 1 unit. May be repeated for credit.
479. **Seminar in French Literature.** Discussion and research on some specialized area in French literature. See Timetable for current topic. 1 unit. May be repeated for credit.
481. **Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as English as a Second Language, German, Russian, and Spanish 481. Language teaching problems considered in the light of theoretical and experimental work in language acquisition, verbal learning and memory, motivation, speech perception, reading, error analysis, and language as an aspect of culture and societal relations. Prerequisite: Consent of instructor. 1 unit.
484. **Narrative Semiotics.** Same as Comparative Literature, English and Religious Studies 484. Introduction to the fundamentals of semiotic analysis of narrative texts, with emphasis on methodology and analytic techniques; primarily addressed to students of literature, but may be useful to students of anthropology, film, communications, texts linguistics, and so forth. In English. 1 unit.
490. **Seminar in Contemporary Criticism, Methods and Theory.** Same as Comparative Literature 490. Deals with a particular individual, school, method or problematic in structuralist or thought; normally taught in English, and texts may be read in French or English, if available. Prerequisite: An introductory course in criticism, or consent of instructor. 1 hour. May be repeated as topic varies.
491. **Individual Topics.** Prerequisite: Graduate standing with a major or minor in French. 1/4 to 2 units.
499. **Thesis Research.** 0 to 4 units

GENERAL ENGINEERING

Head of Department: Professor J. S. Dobrovolny

Department Office: 117 Transportation Building, 104 South Mathews, Urbana

103. **Engineering Graphics, I.** Integrated course in engineering graphics for all students in the College of Engineering. Freehand sketching; theory of orthographic projection and the analysis and synthesis of theoretical and practical problems involving the size, shape, and/or relative positions of common geometrical magnitudes such as points, lines, planes, and other surfaces and solids; theory of

pictorial projections; basic dimensioning; and basic charts and diagrams. 3 hours. Credit is not given for both General Engineering 103 and General Engineering 105.

104. **Engineering Project Design Methodology.** An introductory course covering the methods, techniques, and practice of engineering project design. Individual and team effort design projects are carried out from the proposal, through the development, evaluation, and report phases. Emphasis is placed upon creativity, scheduling and planning, economic factors, and communication processes. Suitable for all students with an interest in engineering and engineering administration. Prerequisite: General Engineering 103 or equivalent, or consent of instructor. 3 hours.
105. **Elements of Drawing.** Theory, techniques, terms, symbols, and conventional practices used in making various types of projection and nonprojection drawings with instruments and freehand. For students in the aircraft maintenance curriculum. Prerequisite: High school plane geometry. 3 hours. Credit is not given for both General Engineering 105 and General Engineering 103.
193. **Special Problems.** Individual investigations of any phase of general engineering selected by the students and approved by the department. Prerequisite: Consent of instructor. 0 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
220. **History of Engineering.** Survey of the major contributions of the science and art of engineering from prehistory to the present; integrates the impact of engineering with the cultural aspects of the various periods. Prerequisite: Junior standing or consent of instructor. 3 hours.
221. **Introduction to General Engineering Design.** Fundamental concepts in the classical and computer-based analysis and design of structural and machine components and assemblies; external and internal loads and displacements in statically determinate and indeterminate configurations; kinematics of linkages, gears, and cams; and cam profile design. Prerequisite: Theoretical and Applied Mechanics 212 and 221, and Computer Science 101. 3 hours.
222. **Analysis of Dynamic Systems.** Introduction to the operational techniques used in describing the behavior of dynamic systems; elements of modeling; equilibrium and linearization; Laplace transformation techniques; system response via the transfer function; block diagrams and computer simulation; matrix operations; system response via state variables; and stability. Prerequisite: Mathematics 345; concurrent registration in Computer Science 101. 3 hours.
232. **Engineering Design Analysis.** Study of stress/strain conditions, solution techniques, and analysis of various engineering materials and configurations, as applied to the development and application of design and analysis criteria. Prerequisite: General Engineering 221. 4 hours.
241. **Component Design.** Studies the design of basic engineering components: structural members, connections, and mechanical elements; applies principles including material failure, fatigue, buckling and other instabilities, reliability, and simulation. Prerequisite: General Engineering 222 and 232. 4 hours.
242. **Project Design.** Design of various engineering devices and systems. Teams of two to four students work toward the development of engineering solutions to problems supplied by industry. A midterm and final report summarize the work of the semester for sponsor and faculty. Prerequisite: Credit or concurrent registration in General Engineering 241 and senior standing. 3 hours.
288. **Economic Analysis for Engineering Decision Making.** Introduction to economic and operational analysis in the engineering decision-making process; mathematics of capital budgeting, mathematical programming, systems analysis, and the application of probability and simulation to decision making. Prerequisite: Junior standing or consent of instructor. 3 hours. Credit is not given for both Electrical Engineering 288 and General Engineering 288.
290. **Legal Aspects of Engineering Contracts and Specifications.** Same as Civil Engineering 290. Laws governing various engineering contracts; tort law and professional liability of engineers; workmen's compensation; property law; and business and technical clauses of specifications. Prerequisite: Senior standing in

- architecture or engineering, or consent of instructor. 3 hours. Credit is not given for both Civil Engineering 290 and General Engineering 292.
- 291. General Engineering Seminar.** Series of lectures and discussions by department faculty and visiting professional engineers on ethics, professional registration, the role of technical societies, and the relation of engineering to such disciplines as economics, sociology, and government. Prerequisite: Senior standing in general engineering. 0 credit.
- 292. Engineering Law.** Nature and development of the legal system; legal relationships, rights and duties, and their importance in the engineering profession; and contracts, torts, agency, business transactions, and liability for defective products. Prerequisite: Senior standing in engineering or architecture, or consent of instructor. 3 hours. Credit is not given for both General Engineering 290 and 292.
- 293. Special Problems.** Individual investigations or studies of any phase of general engineering selected by the students and approved by the department. Prerequisite: Junior standing; consent of instructor. 0 to 4 hours.
- 334. Introduction to Reliability Engineering.** Same as Industrial Engineering 334. See Industrial Engineering 334.
- 360. Engineering Applications of Meteorological Fundamentals.** Application of the fundamentals of meteorology to engineering problems including the transport and diffusion of particulate matter, aerosols, and gases; precipitation processes and rain-out; behavior of stack effluents; and explosion debris. Prerequisite: Physics 106 and 107; Mechanical Engineering 205 and 206, or 209, or Chemistry 342 and 344; senior standing in engineering or physical science. 4 hours or 1 unit.
- 392. Legal Problems in Engineering Design.** The law as it affects engineering design; products liability, product safety legislation, and product standards and certification; legal rights and duties of the design professional; and the patent system and protection of inventions. Prerequisite: Senior standing. 3 or 4 hours, or 3/4 or 1 unit.
- 393. Special Problems.** Study of advanced problems related to general engineering. Prerequisite: Senior standing and consent of instructor. 1 to 4 hours, or 1/4 to 1 unit.
- 491. Simulation of Dynamic Systems.** Modeling and simulation of dynamic engineering systems; distinct modeling approaches for engineering devices; analog and digital computer simulation of dynamic systems; design criteria and performance and design measures; and extensive use of case studies and projects. Prerequisite: General Engineering 222 and Industrial Engineering 385, or equivalent. 1 unit.
- 493. Special Problems.** Advanced problems related to general engineering. Prerequisite: Consent of instructor. 1/4 to 1 unit. May be repeated.
- 495. Evaluation and Management of Engineering Design Projects.** Quantitative evaluation and optimization of project plans, using mathematical programming and multiple-criteria decision making; optimal design and sizing of engineering projects; reliability of designs, studied by acyclic network analysis and network simulation; and implementation and control of engineering designs by network analysis. Prerequisite: General Engineering 288 and Industrial Engineering 385, or equivalent. 1 unit.
- 497. Project Design.** Engineering design projects emphasizing advanced engineering analysis, synthesis, optimization, and engineering economics. 1/4 to 2 units. May be repeated to a maximum of 2 units for credit toward the Master's degree.
- 499. Thesis Research.** 1/4 to 2 units. May be repeated to a maximum of 2 units for credit toward the Master's degree

GENETICS AND DEVELOPMENT

Head of Department: Professor E. H. Brown

Department Office: 515 Morrill Hall, 505 S. Goodwin, Urbana

106. **Heredity and Society.** Provides nonscience students with an understanding of genetics so they can appreciate how recent discoveries and environmental changes may affect their future and the future of society. 3 hours. Students may not receive credit for both Genetics and Development 106 and 210.
107. **Evolution.** Analysis of the theories of evolution, the mechanism of evolutionary changes, and the evolution of man. Prerequisite: Sophomore standing. 3 hours. Students may not receive credit for both Genetics and Development 107 and 301.
210. **Genetics.** Principles of heredity and the nature of genetic material. Prerequisite: Biology 111 or equivalent, or consent of instructor. 4 hours. Students may not receive credit for both Genetics and Development 210 and 106.
211. **Development of Form.** Introduction to the unifying concepts and evolutionary aspects of organismic development with emphasis on descriptive aspects of growth, differentiation, and organogenesis. Prerequisite: Biology 111 or equivalent. 3 hours.
213. **Cells and Tissues.** Lecture and laboratory introduction to the structure of animal and plant cells and tissues, including basic ultrastructure, with emphasis on animal histology. Prerequisite: Biology 111 or equivalent. 4 hours. Students may not receive credit for both Biology 151 and Genetics and Development 213.
290. **Individual Topics.** Laboratory work or reading in fields selected in consultation with a faculty member in the Department of Genetics and Development. Prerequisite: Fifteen hours of life science courses and consent of Genetics and Development faculty sponsor. 2 to 5 hours. May be repeated to a maximum of 10 hours.
301. **Introduction to Evolutionary Biology.** Same as Ecology, Ethology, and Evolution 301. Introduction to the evidence for evolution and the origin and types of genetic variation, stressing various modes of selection and modern observations and experiments illustrating the evolutionary process. Prerequisite: Genetics and Development 210 or equivalent. 3 hours or 3/4 unit. Students may not receive credit for both Genetics and Development 301 and 107.
304. **Biological Clocks.** Study of the nature, mechanisms, functions, development, and evolution of the biological rhythms associated with geophysical cycles; emphasizes circadian rhythms and their role as biological clocks for the timing of photoperiodism, celestial orientation, and human physiology and behavior. Prerequisite: Biology 111 or equivalent. 2 hours or 1/2 unit.
307. **Immunology.** Introduction to fundamentals of immunology with emphasis on biological application; basic background for understanding immunological responses and techniques applicable to biological research. Prerequisite: Four semesters of college biology; a course in organic chemistry, or consent of instructor. 4 hours or 3/4 unit.
309. **Ecological Genetics.** Study of the effects of physical and biological factors on the genetic structure of populations, with emphasis on recent theories of genotype/environmental interactions and their relationship to evolutionary processes. Prerequisite: Genetics and Development 210. 3 hours or 3/4 unit.
311. **Developmental Biology.** Emphasis on the results of genetic, biochemical, and manipulative experiments that provide information on the basic mechanisms of organismic development. Prerequisite: Biology 151 or Genetics and Development 210; Genetics and Development 211 or Biology 251; a course in organic chemistry. 3 hours or 3/4 unit.
312. **Developmental Genetics.** Mechanisms underlying the genetic control of eukaryote development at the molecular and cellular levels. Prerequisite: Biology 151 or Genetics and Development 210; Genetics and Development 211, Biology 251, or Genetics and Development 333; a course in biochemistry. 3 hours or 3/4 unit.

313. **Experimental Genetics.** Laboratory course to expose students to several types of organisms, experimental approaches, and methods of analysis utilized in genetical research. Prerequisite: Biology 151 or Genetics and Development 210; consent of instructor. 4 hours or 1 unit.
314. **Experimental Development.** Laboratory course to expose students to a variety of organisms, experimental approaches, and methods of analysis utilized in developmental research. Prerequisite: Genetics and Development 211, Biology 251, or Genetics and Development 333; consent of instructor. 4 hours or 1 unit.
315. **Human Genetics.** Study of the techniques employed for genetic analysis of human traits; discussion of genetic mechanisms operative in human development, metabolism, and behavior; and genetics and human disease. Prerequisite: Genetics and Development 210; biochemistry and statistics recommended. 3 hours or 3/4 unit.
316. **Population Genetics.** Same as Dairy Science 316. See Dairy Science 316.
317. **Quantitative Genetics.** Same as Dairy Science 317. See Dairy Science 317.
318. **Protozoology.** Basic treatment of the morphology, physiology, and systematics of the protozoa; consideration of their evolution, ecology, morphogenesis, sexual phenomena, genetics, and parasitism with life histories of selected free- living and parasitic forms. Prerequisite: Biology 111 or equivalent. 5 hours or 1 unit.
321. **Parasitology.** Worm parasites: life cycles, morphology, taxonomy, and environmental relations; lecture, laboratory, readings, quiz, demonstrations, and problems. Prerequisite: Biology 111 or equivalent. 5 hours or 1 unit.
330. **Practical Microtechnique.** Introduction to microscopy, microphotography, and histological technique. Prerequisite: Histology or embryology; consent of instructor. 3 hours or 1/2 unit.
331. **Experimental Cytology.** Lectures on structure and function of the cell; coverage on current concepts of cell and molecular biology relating to cellular function, cell division, and organelle interaction. Prerequisite: Genetics and Development 210 or equivalent; consent of instructor. 3 hours or 3/4 unit.
333. **Vertebrate Embryology.** Development of the body and organs of higher vertebrates, with emphasis on human development. Prerequisite: Biology 111 or equivalent. 5 hours or 1 unit.
367. **Analysis of Development.** Lectures on selected areas of research in developmental biology intended to present a variety of current problems, experimental approaches, and results. Prerequisite: Biology 151 or Genetics and Development 210; a course in biochemistry; Genetics and Development 311 or consent of instructor. 3 hours or 3/4 unit. May be repeated to a maximum of 9 hours or 2 1/4 units.
405. **Molecular Genetics: Gene Action.** Structure, synthesis, and function of molecules and organelles concerned with the intracellular transmission of genetic information, (including gene regulation, transcription, and translation). Prerequisite: Microbiology 330, Microbiology 316 plus biochemistry, or consent of instructor. 3/4 unit.
411. **Genetics Seminar.** Student presentations and discussions of selected topics in genetics. 1/4 unit. May be repeated to a maximum of 1 1/2 units.
412. **Developmental Biology Seminar.** Student presentations and discussion of selected topics in developmental biology. 1/4 unit. May be repeated to a maximum of 1 1/2 units.
417. **Advanced Quantitative Genetics.** Same as Dairy Science 417. See Dairy Science 417.
418. **Concepts and Topics in Immunology.** Same as Veterinary Pathobiology 418. See Veterinary Pathobiology 418.
421. **Cytogenetics.** Chromosome theory: the structure, behavior, and physiology of chromosomes in heredity and development. Prerequisite: Genetics and Development 210 or Microbiology 330, or consent of instructor. 1 unit.
425. **Experimental Parasitology.** Same as Veterinary Pathobiology 425. See Veterinary Pathobiology 425.

490. **Individual Topics.** Laboratory work and/or reading conducted under the supervision of faculty members in the Department of Genetics and Development. Prerequisite: Consent of the faculty member who will supervise the work. 0 to 4 units

GEOGRAPHY

Head of Department: Professor A. Getis

Department Office: 220 Davenport Hall, 607 S. Mathews, Urbana

102. **Atmospheric Environment.** Introduction to the processes responsible for the spatial variation of weather and climate with a survey of world climatic patterns. 4 hours.
103. **Earth's Physical Systems.** Systems approach to the physical environment, including landform, soil, vegetation, and animal elements, from a human ecological perspective. 4 hours.
104. **Geographic Perspectives on Human Behavior.** Individual and aggregate human spatial behavior: perception of environment, territoriality, behavior settings, prejudicial uses of space, spatial diffusion, migration, political fragmentation, and spatial patterns of social pathologies. 4 hours.
105. **Introductory Economic Geography.** Geographic analysis of the distribution of various kinds of economic activity; an examination of the patterns resulting from the human exploitation of the world's resources; and emphasis on the principles governing the location of mineral, manufacturing, and commercial activities. 4 hours.
185. **Introduction to Social Statistics.** Same as Sociology 185. See Sociology 185.
198. **Freshman Honors Seminar.** Through discussions and research projects, the seminar is designed to provide an in-depth understanding of topics in the field of systematic or regional geography which are selected for group study. Appropriate geographic methodology is emphasized. Prerequisite: James Scholar standing or other designation as a superior student. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
203. **Fluvial Geomorphology.** A comprehensive review of the roles played by rivers and river systems in changing the earth's surface; evaluates river processes and ensuing forms within all contexts, ranging from the channel itself to entire drainage basins. Prerequisite: Geography 102 or 103, or Geology 101, 107, or 143. 3 hours.
205. **Intermediate Economic Geography.** Study of the spatial organization of society from an economic perspective, emphasizing theories of agricultural, industrial, and commercial location patterns; patterns of consumption and exchange and policy and welfare implications. Prerequisite: Geography 105 or consent of instructor. 3 hours.
210. **Contemporary Social and Environmental Problems.** Geographic perspectives on contemporary national and international problems. Topics vary each semester and include such themes as environmental quality, food production, urban problems, and particular social and political conflicts. 3 hours.
214. **Conservation of Natural Resources.** Survey of distribution of natural resources and major forms of utilization of these resources; emphasizes consequences of utilization systems which deplete or degrade resources and systems which conserve these resources with respect to future needs of human populations. 3 hours.
223. **Geography of Anglo-America.** Occupance patterns of the United States and Canada; regions of Anglo-America; and United States and Canada in world relations. 3 hours.
224. **Geographic Patterns of Illinois.** A systematic analysis of the environmental and human processes that have shaped the regional landscapes of rural and urban Illinois. 3 hours.
271. **Spatial Analysis.** An overview of the spatial analysis (nomothetic) approach to geographic research, both physical and human; includes discussion of the scientific

- method, with explanations and uses of analytic geographic concepts in studying real world problems. Prerequisite: A course in geography. 4 hours.
272. **Introductory Field Geography.** Application of fundamental geographical field techniques to field mapping; develops field mapping skills, permits practical application of geographical principles, and provides a basic understanding of field procedures; and an introduction to advanced field geography for the student who later seeks an advanced degree. One ten-day field trip. 4 to 8 hours.
273. **Spring Field Course.** Field observation and mapping of human and physical phenomena using basic geographic field techniques; required ten-day field trip during spring semester break. Prerequisite: Geography majors, or nonmajors with consent of instructor. 4 hours.
277. **Interpretation of Aerial Photographs.** Same as Forestry 277. Principles and techniques in extraction and analysis of information derived from aerial photographs, including black and white, color, and color infrared; applications to problems in the natural and social sciences stressed in the laboratory. A beginning FORTRAN programming course is highly desirable but not required. Prerequisite: Knowledge of trigonometry (Math 114 or equivalent). 3 hours.
284. **Population Geography.** Problems and issues surrounding the geographic distribution of populations at the world, regional, and local levels; emphasizes problems associated with population growth and decline, recent population redistribution, births and deaths, and elderly and minority populations. 3 hours.
290. **Individual Study.** Supervised independent study of special topics or regions; required for students graduating with departmental distinction. Prerequisite: At least one formal course in the topic or region of interest; consent of instructor. 2 to 4 hours. May be repeated once for credit.
291. **Honors Individual Study.** Individual study and research projects for students who are working toward the degree with distinction in geography. Prerequisite: Consent of honors adviser. 2 to 4 hours. May be repeated to a maximum of 8 hours.
294. **Special Topics in Social Geography.** Introduction to current research in social geography; includes such topics as access to public facilities, geography of crime, innovation diffusion, geography of communications, spatial assimilation of minorities, and geography of social well-being. See Timetable for current topics. 4 hours. May be repeated.
296. **Seminar on the Scope and Purpose of Geography.** The nature of geography; a brief history of the discipline, and an examination of its methodology, content and emerging trends. Strongly recommended for students planning graduate work in geography. 2 hours.
303. **Advanced Physical Geography: Methodology and Applications of Landform Studies.** Systematic analysis of the basic elements of physical geography and their interaction through time and surface expression, including the modifying effects of humans. Complementary to Geology 301. Prerequisite: Geography 103 or consent of instructor. 4 hours or 1 unit.
304. **Soil Geomorphology.** Same as Geology 304. Analysis and review of the principles of soils as applied to geomorphology, archaeology, and geography. One weekend and several one-day field trips; student fees reflect actual field expenses. Prerequisite: Geography 103 or equivalent, or consent of instructor. 4 hours or 1 unit.
305. **Zoogeography.** Introduction to the principles of zoogeography; the central theme explains present distribution of animals, chiefly mammals. Prerequisite: Geography 102 and 103, Geology 102, or consent of instructor. 3 hours or 1 unit.
307. **Periglacial Geomorphology.** Same as Geology 307. Examination of periglacial landscapes through analysis of the formative processes and their interaction with the resulting forms. Prerequisite: Geography 303, Geology 301, or consent of instructor. 4 hours or 1 unit.
308. **Geomorphology of Coasts.** An analysis of the morphology of marine coasts including study of their distributions and of the physical factors that have influenced their development and distribution; analyzes effects of human-induced stress on modern beaches. Prerequisite: Geography 103 or equivalent. 4 hours or 1 unit.

313. **Climates of the Continents.** Regional treatment of the climates of the world by continents. Prerequisite: Geography 102 or consent of instructor. 3 hours or 3/4 unit.
314. **Regional Problems in Resource Management.** Major problems of resource utilization examined in regions where problems are most acute; emphasizes interrelationships among resource management problems, environmental consequences of resource utilization, and the problems of public policy involved in resource management. 3 hours or 3/4 unit.
315. **Physical Climatology.** A survey of the basic concepts of energy balance climatology and synoptic climatology, with emphasis on the microscale and the global scale; lectures supplemented by calculations and field observations examining the effects of location and surface characteristics on determination of climate. Prerequisite: Mathematics 112, Physics 101, and Geography 102; or consent of instructor. 3 hours or 1 unit.
325. **Historical Geography of American Landscapes to 1880.** Changing patterns of spatial organization in the United States and Canada, circa 1400 A.D. to 1880; focuses on landscape patterns through time (especially the built environment), perception of relic landscapes in the present day, and contemporary preservation of historic areas as historic places. 4 hours or 1 unit.
326. **Historical Geography of American Landscapes Since 1880.** Review of the values and technologies which underlie the structuring of the American built environment during the past century; emphasizes the changing meaning of urban, suburban, small town, rural, and wilderness places in American life and is concerned with the image of place as a basis for historic preservation. 4 hours or 1 unit.
327. **American Vernacular: The Cultural Landscape.** Focuses on vernacular structures in the cultural landscape, especially common houses, barns, and commercial and industrial structures; examines origin and geographical diffusion of vernacular architecture in the United States. 4 hours or 1 unit.
330. **Ecological Climatology.** Same as Ecology, Ethology, and Evolution 330. See Ecology, Ethology, and Evolution 330.
331. **Geography of Caribbean America.** Survey of the physical elements and occupancy sequences that distinguish the geographic regions of Mexico, Central America, Panama, and the West Indies. 3 hours or 3/4 unit.
332. **Geography of South America.** Regional geography of South America with emphasis on the southern hemisphere of that continent. 3 hours or 3/4 unit.
342. **Geography of Europe.** Analysis of the changing social, economic, and political geography of western Europe; special consideration to population changes and labor migrations and to planning problems in the underdeveloped regions and conurbations of the continent. 3 hours or 3/4 unit.
353. **Geography of the U. S.R.** Physical and cultural regionalism; a survey of natural resources and patterns of human occupancy including industry, agriculture, and transportation. 3 hours or 3/4 unit.
355. **Geography of Central and South Africa.** Regional geography of Africa south of the Sahara. 3 hours or 3/4 unit.
361. **Geography of Agricultural Land Utilization.** Geographic consideration of the nature of agricultural land utilization from the world, continental, and regional viewpoints; special emphasis on the geographical implications of various types of agricultural land use and upon the interrelationships between areas of different types of land utilization. 3 hours or 3/4 unit.
363. **Geography of Mineral Resources.** An examination of the spatial aspects of the production and use of mineral resources; concerns the adequacy of supply and the environmental and economic consequences of mineral use. 3 hours or 3/4 unit.
365. **Transportation Systems and Spatial Development.** Descriptors of transportation systems; allocation models; transportation as an industrial activity and public good; and transportation and spatial development, including the role of transportation in developing countries and in urban and regional development and problems involved in measuring the impact of transport investment. 3 hours, or 1/2 or 1 unit.

366. **Location of Industry and Other Economic Activities.** Industrial site selection in theory and practice; examines the effect of factors such as materials, markets, labor, transportation, and environmental constraints on industrial location; and evaluates urban commercial patterns and factors affecting the location of commercial activities. 3 hours or 3/4 unit.
370. **Introduction to Quantitative Methods in Geography.** Introduction to statistical, numerical, and mathematical techniques used in geographic research; introduction to computer usage in geographic research. Prerequisite: Geography 185, one year of college mathematics, or one course in statistics, or equivalent. 4 hours or 1 unit.
371. **Introduction to Research.** Alternative approaches to research in geography; detailed consideration of geographic research proposals; and discussion of methods of initiating geographic research projects, source materials for geographic research, and communicating research results. Prerequisite: Geography major. 3 hours or 3/4 unit.
373. **Map Compilation and Construction.** Instruction and practice in the basic techniques of map making followed by a consideration of problems involved in the construction of maps for presentation in a reproduced form (i.e., printed, photographed); the selection of proper source materials for the base and body of the map, the compilation and correlation of these materials, and methods of mechanical and photographic reproduction. 4 hours or 1 unit.
374. **Thematic Map Design and Production.** Applies modern design principles to making thematic maps for various uses; the production of maps and atlases, emphasizing multicolor reproduction. Prerequisite: Geography 373 or equivalent. 4 hours or 1 unit.
375. **Computer Cartography.** Introduction to concepts and techniques for computer mapping with spatial or statistical data; universal computer mapping strategies, with applications in the laboratory; cartographic data capture, covering data structures, devices, manipulation, and display; and a synthesis of geographic information systems. Prerequisite: Geography 185 or equivalent. 4 hours or 1 unit.
377. **Introduction to Remote Sensing.** Same as Forestry 377. Fundamentals of energy-matter interaction mechanisms, and the manifestation of reflected and emitted radiation on photographs and images; introduces characteristics of aerial films and filters, electro-optical scanners, and digital processing are introduced; and emphasizes applications in environmental problems. Prerequisite: Geography 277 or equivalent, Geography 185 (beginning statistics) or equivalent, or consent of instructor. 3 hours or 3/4 unit.
378. **Techniques of Remote Sensing Image Analysis.** Optical and digital information processing of imagery acquired from aircraft and satellite remote sensing platforms; includes systems design, mensuration theory, photographic enhancement techniques, and automatic digital classification for all of the standard sensor systems; and laboratory focussing on the design and implementation of information processing techniques with application limited to a survey of uses. Prerequisite: Geography 370 and 377, or equivalent. 4 hours or 1 unit.
380. **Urban Form and Function in Pre-Industrial Western Society.** A review of urban landscapes and functions and of the development of city systems in the historical geography of western civilization prior to industrialization. Previous course work in history or historical geography is desirable. 3 hours or 3/4 unit.
381. **Russian Culture History and Ethnology.** Same as Anthropology 381. See Anthropology 381.
382. **Siberian Culture History and Ethnology.** Same as Anthropology 382. See Anthropology 382.
383. **Urban Geography.** Distribution, functions, and internal structures of cities; emphasizes contemporary metropolitan and central city problems. 3 hours or 3/4 unit.
384. **Migration and Spatial Interaction.** Theories and models of migration; contemporary migration patterns; information flow and individual movement in geographic space; and individual level and aggregate models of spatial interaction. 3 hours or 1 unit.

385. **Cognition of the Geographical Environment.** An overview of theoretical approaches to environmental cognition, including personal construct theory, environmental learning theory, attitude theory, and sociological/cross-cultural perspectives; related geographical problems, including hazard perception, behavioral consequences of alternative environmental arrangements, spatial orientation, way finding, cognitive distance, environmental preferences, responses to environmental stress, and territoriality. 3 hours or 1 unit.
386. **Political Geography.** Territorial behavior of nation-states; boundary conflicts and influences; regional voting patterns in the United States; malapportionment and gerrymandering; voting behavior of American minorities; and metropolitan fragmentation and spatial access to public services. 3 hours or 3/4 unit.
403. **Physical Systems in Landform Analysis.** Same as Geology 403. A study of the phenomena of the physical landscape in terms of the basic principles of systems theory. Prerequisite: Geography 303 or equivalent, or consent of instructor. 1 unit.
404. **Critical Analysis of Concepts and Models in Geomorphology.** The interpretation of a landscape and its evolution is dependent on which of the available models the geomorphologist accepts; the course focuses on the importance and ramifications of this choice. Prerequisite: Graduate standing and consent of instructor. 1 unit.
405. **Seminar in Physical Geography.** Advanced study of one of several topics that vary from semester to semester and include: (a) paleogeography; (b) climatic change; (c) landform and climate; (d) numerical analysis of landforms; (e) research philosophy of physical geography; (f) quaternary problems; (g) urban physical environments; (h) ecological aspects of climatic change; (i) contemporary problems in physical geography; (j) economic impacts of weather and weather forecasting; and (k) laboratory and field methods in soils geography. Prerequisite: Advanced course work in physical geography and consent of instructor. 1/2 to 1 unit.
406. **Urban and Regional Analysis.** Same as Urban Planning 406. See Urban Planning 406.
429. **The Evolution of Agricultural Economies.** Same as Agronomy 429 and Anthropology 429. See Anthropology 429.
430. **Bioclimatic Modeling.** Same as Ecology, Ethology, and Evolution 430. See Ecology, Ethology, and Evolution 430.
444. **Paleoclimatology.** Worldwide trends in (primarily Holocene) climatic history; paleoclimatic sources, qualitative and quantitative interpretation, synoptic models which explain observations, and spatial patterns and temporal trends. Prerequisite: Geography 102 or 313, or consent of instructor. 1 unit.
450. **Issues in Regional Development.** Same as Urban Planning 450. Establishment and articulation of regional development goals; includes trade-offs, the role of government in regional development, analytical problems in the evaluation of regional public policy, and comparison and evaluation of regional development programs in a number of countries. Prerequisite: Urban Planning 406. 1 unit.
456. **Regional Science Methods: Economic and Demographic.** Same as Urban Planning 456. See Urban Planning 456.
457. **Seminar in Regional Science.** Same as Urban Planning 457. Discusses advanced topics in regional science; prepares students for dissertation and thesis research, applied study for public agency, or other student research. Prerequisite: Urban Planning 456, Economics 461, or consent of instructor. 1 unit.
463. **Historical Geography.** History and philosophy of historical research in geography. Research strategies for the analysis of individual and aggregate spatial behavior in the past, derived geographical patterns, changing spatial behaviors and patterns through time, and historical values underlying contemporary geographical decision making. 1 unit.
464. **Problems in Historical Geography.** Research seminar focused on the interests of participating students and faculty; application of geographic theory to the study of past geography, geographic change in the past, spatial behavior in the past, and/or evidence of spatial behavior in the contemporary scene. Prerequisite: Geography 370 or equivalent; prior preparation in historical geography. 1 unit.

470. **Advanced Spatial Analysis.** Advanced techniques of spatial analysis, including spatial autocorrelation, trend surface analysis, grouping and regionalization procedures, and point pattern analysis. Prerequisite: Geography 370 or equivalent. 1 unit.
473. **Problems in Cartography.** Subjects for map presentation are selected in the student's field of specialization or area of interest. Data are collected and maps compiled and carried to completion in final drafted form suitable for publication. Prerequisite: Geography 373 or consent of instructor. 1 unit.
478. **Advanced Field Geography.** Field experience in some aspect of physical or human geography which normally involves primary data collection in the field through mapping, survey, interview, archival, or other procedures; work culminates in a written report. Prerequisite: Graduate standing in geography. 1/2 to 2 units.
495. **Advanced Studies in Geography.** Seminar and directed individual investigation of selected problems or regions, designed to develop ability to conduct independent investigation. All students are required to register each semester in version Z (the departmental colloquium) for 0 units in addition to other 495 work which may be selected. 0 to 2 units. Scheduled seminars and staff interests and availabilities are detailed in each semester's Timetable.
497. **Development of Geographic Thought.** Historical survey of the discipline from the Greco-Roman period to the present. 1/2 unit.
499. **Thesis Research.** 0 to 4 units.

GEOLOGY

Head of Department: Professor J. Hower

Department Office: 245 Natural History Building, 1301 W. Green, Urbana

101. **An Introduction to the Study of the Earth.** Primarily intended for nonscience students. Integrates all aspects of geological science into a unified theory of the evolution and continuing dynamic behavior of the earth. 4 hours.
102. **History of the Earth.** Primarily intended for nonconcentrators in geology. History of the earth from the physical and biological points of view, methods of determining earth history. One-day field trip may be required. Students may not receive credit for both Geology 102 and 103. 4 hours.
103. **History of Life.** For nonconcentrators in geology. A survey of the history of the plants and animals that have populated the earth, and the geologic setting in which fossils are found. Required one-day field trip. Students may not receive credit for both Geology 103 and either Geology 102 or 104. Prerequisite: Geology 101 or 107. 3 hours.
104. **Geology and Society.** Aspects of geology which are most significant to man and society, such as dynamic processes, geologic hazards, and energy and mineral resources; man's impact on the earth, including environmental degradation; and society's response to the geological framework, including land-use planning, management, and control. Students may not receive credit for both Geology 104 and 143. Prerequisite: Geology 101, 102, or 107. 3 hours.
105. **Geology of Energy.** For nonconcentrators in geology. Geological factors governing or affecting the occurrence, exploitation, and utilization of fossil fuels, nuclear fuels, wind and water power, tidal energy, and other energy sources; principles of estimation of resources; and environmental, economic, social, and political concerns. Prerequisite: Geology 101, 102, or 107, or Geology 142 or 143, or consent of instructor. 3 hours.
107. **General Geology, I.** Introductory course for science and science-oriented students. Concerned with the chemical and physical aspects of the earth, development of methods for investigating geologic problems, and a survey of the more significant

observations and interpretations. Field trip required for geology concentrators, recommended for others. 4 hours.

108. **General Geology, II.** Primarily intended for science and science-oriented students. Considers origin of the solar system and earth, origin of life, climatic changes, and other documented and inferred events of major and evolutionary significance during the past 5000 million years as well as predictable future events. Field trip required. Students may not receive credit for Geology 108 and 103. Prerequisite: Geology 107 or consent of instructor. 4 hours.
115. **Regional Field Study.** Field observations in a region of diverse geology. One- to two-week field trip. Credit is given only on completion of a satisfactory written report. Prerequisite: Geology 101, 102, 107, 142, or 250. 2 hours.
142. **Physical Science in Modern Society.** Physical science for nonscience majors, emphasizes the basic chemical and physical aspects of the earth's environmental systems and the impact of modern technology on these systems. 3 hours.
143. **Environmental Physical Science.** Physical science for nonscience majors; emphasizes earth processes and resources relevant to modern society, including the availability and by-products of utilization of energy and water resources and the limitations imposed by earth processes on society. Students may not receive credit for Geology 143 and 104. 3 hours.
170. **Introduction to Oceanography.** The nature of the sea floor; the theory of sea-floor spreading; marine sediments; physical and chemical properties of sea water; circulation of the ocean; waves and tides; life-styles and habitats of marine organisms; productivity of the oceans; and food and mineral resources of the ocean. Prerequisite: Geology 101, 102, or 107, or equivalent; or consent of instructor. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
250. **Geology for Engineers.** Physical geology with an emphasis on those aspects of the natural environment which are of importance to the engineer. Prerequisite: Theoretical and Applied Mechanics 150 or 152; sophomore standing in the College of Engineering. 3 hours.
290. **Individual Study.** Research and individual study in geology. Students desiring honors credit should register in the honors section (see current Timetable). Prerequisite: Consent of supervising faculty member; for honors credit, consent of departmental honors advisor also is required. 1 to 4 hours. A maximum of 8 hours may be counted towards graduation.
292. **Senior Thesis.** Research, with thesis; a thesis must be submitted for credit to be received. Students desiring honors credit should register in the honors section (see current Timetable). Prerequisite: Consent of supervising faculty member; for honors credit, consent of departmental honors advisor also is required. 2 to 8 hours. A maximum of 10 hours may be counted towards graduation.
301. **Geomorphology.** History, origin, and characteristics of land forms produced by fluvial, glacial, wind, and wave erosion or by a combination of these acting upon the major kinds of geologic materials and structures. Lectures, laboratory, and field trips. Prerequisite: Geology 108 or consent of instructor. 4 hours or 1 unit.
303. **History of Geology.** Development of the fundamental concepts of the geological sciences from classical to modern times. Prerequisite: Geology 108 or consent of instructor. 4 hours or 1 unit.
304. **Soil Geomorphology.** Same as Geography 304. See Geography 304.
307. **Periglacial Geomorphology.** Same as Geography 307. See Geography 307.
309. **Sedimentology.** Introduction to principles of sediment erosion, transport, and deposition; origin of sediment texture, sedimentary structures, sedimentary sequences, sediment mineralogy, and diagenesis; and sediment deposition in fluvial, deltaic, deep water, tidal flat, continental shelf, and beach and barrier island environments. Discussion of occurrences of petroleum, natural gas, coal, uranium, and metalliferous accumulations in each of these sedimentary environments. Field trip required. Prerequisite: Geology 108 or consent of instructor. 2 hours or 1/2 unit.
310. **Field and Laboratory Procedures in Sedimentology.** Introduction to the field and laboratory study of Holocene sediments and sedimentary rocks, with emphasis on

- field sampling, sieve-size analysis, peel making of unconsolidated sediments and sedimentary rocks, x-ray radiography, disaggregation of sediments, heavy mineral analysis, mineral identification by staining, pH-Eh determinations, and thin-section preparation. Required field work. Must be taken concurrently with Geology 309. Prerequisite: Geology 108 or consent of instructor. 1 hour or 1/4 unit.
311. **Structural Geology.** Rock deformation and its results. Lectures, laboratory, and required field trip. Prerequisite: Geology 108 or consent of instructor. 4 hours or 1 unit.
315. **Advanced Field Methods.** Mapping a structurally and/or stratigraphically significant area of moderate size and difficulty; preparation of a report. Prerequisite: Geology 317. 2 to 8 hours, or 1/2 to 2 units.
317. **Field Geology in the Rocky Mountains.** Field course conducted in the Rocky Mountains; introduction to field techniques, geologic mapping, and field training in stratigraphy, petrology, structure, and geomorphology. Offered in summer session only. Prerequisite: Eight hours of 300-level credit in geology, including Geology 321 or 332; or consent of instructor. 8 hours or 2 units.
320. **Introduction to Paleontology.** A survey of the principles of paleontology and the major invertebrate groups; includes how fossils are studied, taxonomy, functional morphology, evolution, paleoecology, paleobiogeography, and biostratigraphy. Lectures, laboratory, and required field trip. Prerequisite: Geology 102 or 108, Ecology, Ethology, and Evolution 320, or consent of instructor. 4 hours or 1 unit.
321. **Principles of Stratigraphy.** Definition, description, and correlation of stratigraphic units; facies analysis, environmental interpretation, and historical inference; and laboratory work, including analysis of samples from the subsurface, interpretation of geophysical logs, and seismic stratigraphy. Emphasizes practical applications, especially to mineral fuel exploration and exploitation; required field trip. Prerequisite: Geology 108 or consent of instructor. 4 hours or 1 unit.
324. **Late Cenozoic Geology.** Same as Anthropology 324. A study of stratigraphic principles and practices, dating methods, geologic history of the last twenty million years, geologic materials, and paleosol recognition appropriate for archeologists, anthropologists, geographers, and others concerned with archaic human inhabitation of the earth. Prerequisite: Geology 108 or consent of instructor. 4 hours or 1 unit.
325. **Paleobotany.** Same as Botany 325. See Botany 325.
332. **Mineralogy-Petrology.** Introduction to the structure, chemistry, and stability of the major silicate minerals and their occurrence in rocks; required field trip. Prerequisite: Geology 108 or consent of instructor; Chemistry 102 or 108. 4 hours or 1 unit.
335. **Optical Mineralogy.** Study of crystalline matter, especially minerals, by polarized light microscopy and powder x-ray diffractometry. Prerequisite: Geology 332. 4 hours or 1 unit.
336. **Igneous and Metamorphic Petrography.** Study of the constituents, composition, texture, structures, and classification of igneous and metamorphic rocks; laboratory study of rocks in hand specimen and thin section. Prerequisite: Geology 335. 4 hours or 1 unit.
338. **Introduction to Sedimentary Petrography.** Introduction to the microscopic study of sedimentary rocks in thin section with emphasis on their textural properties as a basis for their classification and environmental interpretation. Prerequisite: Geology 335. 4 hours or 1 unit.
350. **Introduction to Geophysics.** Introduction to basic concepts related to the physics of the earth's interior; includes formation and composition, gravity and shape, seismology, heat flow and internal temperatures, magnetism, rheology, and plate tectonics. Prerequisite: Mathematics 240 or 245, or equivalent; Physics 102 or 107. 4 hours or 1 unit.
351. **Geophysical Prospecting.** Same as Mining Engineering 351. See Mining Engineering 351.
357. **Glacial and Pleistocene Geology.** Consideration of glacial flow, erosion, and deposition; stratigraphic analysis of glacial deposits and correlation of Pleistocene

- glacial successions with nonglacial sediments; and field trip and required field work. Prerequisite: Consent of instructor. 4 hours or 1 unit.
360. **Chemistry of the Earth.** Fundamental chemical and physical concepts applied to earth surface processes, the history of the earth as a chemical system, and the relation of the earth to the solar system and the universe. Background in both physical chemistry and geology would be helpful. Prerequisite: Consent of instructor. 4 hours or 1 unit.
370. **Oceanography.** Principles of biological, chemical, geological, and physical marine science. Prerequisite: Botany 100; Chemistry 101, Geology 101 or 107, and Physics 101; or consent of instructor. 4 hours or 1 unit.
397. **Special Topics in Geology.** Seminar or lectures in subjects not covered by regular course offerings; for advanced undergraduates and graduate students. See Timetable for current offerings. Prerequisite: Consent of instructor. 1 to 4 hours, or 1/4 to 1 unit.
403. **Physical Systems in Landform Analysis.** Same as Geography 403. See Geography 403.
415. **Regional Field Geology.** Field study of critical localities within a geologic province during a period of two or three weeks; discussion of observations and preparation of reports in which the concepts and principles mastered in graduate study are applied to regional geologic synthesis. Prerequisite: Consent of instructor. 1 unit.
420. **Paleoecology.** Interpretation of life habit of fossil organisms from skeletal morphology and associated depositional features; reconstruction of marine ecosystem relationships from the study of assemblages of fossils. Prerequisite: Geology 320 or equivalent. 1 unit.
421. **Topics in Paleontology.** Selected topics in macro- and micropaleontology. Intensive study of a selected invertebrate or algal group; special problems in the taxonomy, evolution, skeletal diagenesis, ecology, biogeography, and biostratigraphy of selected fossil organisms. Prerequisite: Geology 320, Ecology, Ethology, and Evolution 320, or consent of instructor. 1 unit. May be repeated.
422. **Advanced Stratigraphic Geology.** The concept of the Phanerozoic eras, periods, stages, and zones; evaluation of the type sequences and the succession of faunas; and problems of correlation and historical inference. Prerequisite: Consent of instructor. 1 unit.
431. **Structural Mineralogy.** Principles of the crystal chemistry and structural classification of minerals, and survey of current knowledge about the structures and structurally dependent properties and behavior of representative minerals and mineral groups. Prerequisite: Consent of instructor. 1 unit.
432. **Sedimentary Geochemistry.** Equilibrium assemblages among the principal organic and inorganic sedimentary solids and their associated liquids during weathering, deposition, and diagenesis; kinetics and mechanism of phase changes; and transport processes during diagenesis. Prerequisite: Geology 360 or equivalent, or consent of instructor; some background in physical chemistry desirable. 1 unit.
433. **Isotope Geology.** Introduction to the theoretical basis for isotopic fractionation in nature; survey of isotopic variations in natural materials; and application of isotopic variations to problems of geological and environmental significance. Prerequisite: Consent of instructor. 1 unit.
434. **Theoretical Petrology.** Use of thermodynamic and kinetic arguments in the solution of basic petrological problems. Prerequisite: Consent of instructor. 1 unit.
435. **Igneous and Metamorphic Petrology.** Application of chemistry and physics to the study of crystalline rocks, with emphasis on the integration of theory with field and laboratory observations; topics selected on the basis of student interest and training. Prerequisite: Geology 336. 1 unit. May be repeated for credit.
437. **Sedimentary Processes.** Application of fluid mechanics to quantitative analysis of erosion, transport, and deposition by open channel flow, waves, tidal currents, longshore currents, turbidity currents, wind, and ice; quantitative determination of origin of physical sedimentary mineralogy; and processes of weathering and

- diagenesis. Prerequisite: Geology 309 and 335, or equivalent, or consent of instructor. 1 unit.
438. **Sedimentary Petrography.** Microscopic study of sedimentary rocks in thin section with emphasis on textures and structures as a basis for their detailed classification and genetic interpretation. Prerequisite: Geology 335 and 437. 1 unit.
443. **Mineral Deposits.** Principles of mineral deposition and genesis of mineral deposits; required field trip. Prerequisite: Geology 311. 1 unit.
444. **Depositional Models for Petroleum Exploration.** Analysis and integration of stratigraphic, petrographic, and geochemical features of all types of sedimentary rocks into depositional models; application of these models to basin analysis and in particular to exploration for oil and gas reserves. Prerequisite: Geology 338 or 438, or consent of instructor. 1 unit.
450. **Principles of Engineering Geology.** Study of the effects that lithology, weathering, joints, faults, and ground water have upon engineering projects; the description and origin of geologic factors and their significance in the design, construction, and performance of civil engineering undertakings. Field trip or term paper required. Prerequisite: Geology 250 or equivalent, or consent of instructor. 1 unit.
451. **Practice of Engineering Geology.** Review of modern geotechnical exploration techniques (borings, downhole logging, surface geophysics, and remote sensing) and study of case histories illustrating the influence of significant geologic features on exploration design, construction, and performance of civil engineering projects. Field trip or term paper required. Prerequisite: Geology 450 and Civil Engineering 383, or consent of instructor. 1 unit.
455. **Hydrogeology.** Geology of the occurrence, storage, movement, and quality of water in the rocks of the earth's crust. Prerequisite: Consent of instructor. 1 unit.
461. **Mineralogy of Clays.** Same as Ceramic Engineering 461. Composition of various types of clays; the structure and properties of the clay minerals; and the origin and mode of occurrence of the clay minerals and clay materials. Field trip required. Prerequisite: Geology 336 or equivalent; consent of instructor. 1 unit.
462. **Mineralogy of Clays.** Same as Ceramic Engineering 462. Properties of clay materials, their relation to the structure of the clay minerals, and methods of determination and control; the utilization of clays in various arts and industries; and required field trip. Prerequisite: Geology 461. 1 unit.
477. **Recent Sedimentary Environments.** Review of sedimentary processes, physical sedimentary parameters, and sedimentary mineralogy in fluvial, lake, dune, beach, barrier island, bar, deltaic, tidal flat, lagoonal, bay, marsh, continental shelf, continental margin, submarine canyon, and deep ocean floor environments; sedimentological aspects of predicting occurrences of oil, natural gas, coal, uranium, and metalliferous deposits in ancient analogs of these environments; and sedimentological aspects of land usage, and conservation and preservation of man's environment. Prerequisite: Geology 437 or consent of instructor. 1 unit.
480. **Mathematical Methods in Geology.** Introduction to and application of the mathematical topics utilized in the geological sciences. Prerequisite: Mathematics 240, 241, or 245, or equivalent. 1 unit.
481. **Transport Processes in Geology.** Introduction to the basic concepts of energy, mass, and momentum transport and their application to problems in the geological sciences. Prerequisite: Geology 480 or consent of instructor. 1 unit.
488. **Advanced Structural Geology.** Analysis of geologic deformation based upon the principles of mechanics and utilizing research data from laboratory and field investigations; methods in structural analysis. Prerequisite: Geology 311 or consent of instructor. 1 unit.
489. **Geotectonics.** Nature and distribution of major earth structures and geological and geophysical evidence bearing on their origin. Prerequisite: Geology 311 or consent of instructor. 1 unit.
493. **Advanced Studies in Geology.** 1/4 to 2 units. Work may be taken in the following fields: (a) clay mineralogy; (b) engineering geology; (c) geomorphology and glacial geology; (d) general geology; (e) ground-water geology; (f) micropaleontology; (g)

mineral deposits; (h) mineralogy and crystallography; (i) paleontology; (j) geochemistry; (k) geophysics; (l) petrography and petrology; (m) sedimentology; (n) stratigraphy; (o) oceanography; (p) submarine geology; (q) structural geology and geotectonics; (r) mathematical geology; (s) sedimentary petrography; (t) petroleum geology; (u) coal geology; (v) isotope geology and geochronology; (w) electron beam analysis; (x) vulcanology; (y) environmental geology; and (z) planetology.

499. **Thesis Research.** Individual work under supervision of members of the staff in their respective fields. 0 to 4 units

GERMANIC LANGUAGES AND LITERATURES

(Including German, Germanic, and Scandinavian)

Head of Department: Professor E. H. Antonsen

Department Office: 3072 Foreign Languages Building, 707 South Mathews, Urbana

German

Students in elementary and intermediate language courses may not ordinarily register for credit in more than one course at the same semester level (e.g., 104 or 114 or 124). Approval to do so must be obtained from the department.

101. **Elementary Course.** Oral practice, reading, and grammar for beginners. 4 hours.
102. **Elementary Course.** Continuation of German 101. Prerequisite: One semester of college German or equivalent. 4 hours.
103. **Intermediate Course.** Continuation of German 102. Prerequisite: Two semesters of college German or equivalent. 4 hours.
104. **Intermediate Course.** Continuation of German 103. Prerequisite: Three semesters of college German or equivalent. 4 hours.
113. **Intermediate Speaking.** Practice in speaking idiomatic German; emphasis on spontaneous expression. Prerequisite: Two semesters of college German or equivalent. 4 hours.
114. **Intermediate Speaking.** Continuation of German 113. Prerequisite: Three semesters of college German or equivalent. 4 hours.
124. **Intermediate Reading.** Practice in reading German, with emphasis on expository prose. Prerequisite: Three semesters of college German or equivalent. 4 hours.
153. **Practice in Conversation.** Emphasis on learning to converse in German in an everyday manner. Prerequisite: Two semesters of college German or equivalent. 2 hours.
189. **Living German--German Living.** Practice in speaking German for students living in the German House. Prerequisite: Elementary speaking knowledge of German. 1 hour. May be repeated to a maximum of 3 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **German Literature in Translation.** Same as Comparative Literature 224. Introduction to German literature for students with no knowledge of German. 3 hours. May be repeated as topics vary.
211. **Conversation and Writing.** Prerequisite: German 104 or equivalent, or consent of instructor. 3 hours.
212. **Conversation and Writing.** Continuation of German 211. Prerequisite: German 211 or equivalent, or consent of instructor. 3 hours.

220. **Business German.** The spoken and written language of the German business world; formalities and conventions of letter writing, banking, import/export, and other commercial transactions. Prerequisite: German 212 or equivalent, or consent of instructor. 3 hours.
225. **German-Speaking Europe Today.** Examines contemporary civilization and culture in the German-speaking countries of Europe, including reference to historical, political, and economic developments. Not open to German concentrators or German teacher trainees. 3 hours.
231. **Introduction to German Literature, I.** Introductory study of representative works (prose, drama, lyrics) by outstanding German, Austrian, and Swiss writers of the modern period, such as Eichendorff, Buechner, Wedekind, Schnitzler, T. Mann, Borchert, Frisch, and Boell. Prerequisite: Two years of college German or equivalent. 3 hours.
232. **Introduction to German Literature, II.** Introductory study of representative works (prose, drama, lyrics) by outstanding German, Austrian, and Swiss writers of the modern period, such as Storm, Keller, Hauptmann, Kaiser, Kafka, Brecht, and Duerrenmatt. Prerequisite: German 231 or equivalent. 3 hours.
270. **Parateaching.** Same as French, Latin, Russian, and Spanish 270. See French 270.
279. **Introduction to Foreign Language Education.** Same as French, Humanities, Latin, Russian, and Spanish 279. See Humanities 279.
280. **Teachers' Course.** Introduction into the problems of the teaching of German and a study of textbooks. Prerequisite: Senior standing or consent of instructor. 4 hours.
293. **Honors Senior Thesis.** Intended primarily for candidates for honors in German, but open to other seniors. Prerequisite: Senior standing; consent of instructor. 2 to 4 hours. May be repeated.
296. **Special Topics in German Literature.** Same as Comparative Literature 228. Introductory study in such topics as individual authors, selected literary movements or periods, modes of inquiry in literary study, minor genres, subgenres, extraliterary influences, etc. Prerequisite: Reading fluency in German beyond the fourth-semester college level. 3 hours.
299. **Study Abroad.** Lectures, seminars, and practical work in German language, literature, civilization, and in other academic areas appropriate to the student's course of study. Prerequisite: German 211 or equivalent; 3.75 overall average; 4.0 average in German courses. 0 to 17 hours. May be repeated to a maximum of 34 hours per academic year.
301. **Advanced Conversation, Composition, and Syntax.** Intensive study of advanced problems of grammar, syntax, and style. Prerequisite: German 211 and 212, or equivalent. 3 hours or 1/2 unit.
302. **Advanced Conversation.** Practice in free conversation with a native speaker. Prerequisite: German 301 or equivalent. 1 hour or 0 unit.
311. **German Literature 750-1450.** Literary, thematic, cultural, and bibliographical analysis of the major authors, works, genres, and movements in German literature from 750 to 1450. Prerequisite: German 232 or equivalent. 3 hours, or 3/4 or 1 unit.
312. **German Literature 1450-1770.** A literary, thematic, cultural, and bibliographical analysis of the major authors, works, genres, and movements in German literature from 1450 to 1770. Prerequisite: German 232 or equivalent. 3 hours or 3/4 unit.
320. **History of German Civilization.** Selected topical, historical, and pictorial analysis of Germany's culture and civilization. Prerequisite: German 232 or equivalent. 4 hours or 3/4 unit.
330. **Modern German Poetry.** Same as Comparative Literature 323. A poetical and metrical survey of modern German lyric verse. Prerequisite: German 232 or equivalent. 3 hours or 3/4 unit.
331. **The German NOVELLE.** A study of the development of the German NOVELLE as a genre, together with reading and discussion of Novellen from Goethe to Grass. Prerequisite: German 232 or equivalent. 3 hours or 3/4 unit.
332. **German Drama.** German drama from the classical to the modern period; selected works of representative playwrights, such as Lessing, Goethe, Schiller, Kleist,

- Grillparzer, Hebbel, Buechner, Hauptmann, Kaiser, Brecht, Frisch, Weiss, and Mueller. Prerequisite: German 232 or equivalent. 3 hours or 3/4 unit.
335. **Literature and Culture of the German Democratic Republic.** History, politics, and literature of the German Democratic Republic. Prerequisite: German 232 or equivalent. 3 hours or 3/4 unit. exhaustive paper.
341. **Martin Luther.** Same as Religious Studies 341. Special attention to Luther as an artist, and to his importance for the development of German language and literature; attention also paid to the historical and intellectual trends of the fifteenth and sixteenth centuries as well as to the significance of Luther in modern psychological and sociological thought. Prerequisite: A reading knowledge of German. 3 hours or 3/4 unit.
342. **Goethe.** Introduction to Goethe's life and works. Prerequisite: German 232 or equivalent. 3 hours or 3/4 unit.
343. **Goethe's FAUST.** Intensive study of Goethe's FAUST, Parts I and II, with an examination of the theme's evolution in literature. Prerequisite: German 232 or equivalent. 3 hours or 3/4 unit.
360. **Principles of Language Testing.** Same as English as a Second Language, French, and Spanish 360. See English as a Second Language 360.
365. **Structure of the German Language, I (Phonology and Morphology).** Introductory survey of the phonological and morphological structure of the German language. Prerequisite: Three years of college German or equivalent. 3 hours or 3/4 unit.
366. **Structure of the German Language, II (Syntax).** Introduction to German syntax; theory and practical applications. Prerequisite: German 365 or consent of instructor. 3 hours or 3/4 unit.
382. **Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as a Second Language, French, Humanities, Slavic, and Spanish 382, and Linguistics 386. See Humanities 382.
387. **Introduction to Myth and Folklore.** Same as Comparative Literature, English, Slavic, and Speech Communication 387. See English 387.
390. **The German Cinema.** History and criticism of the German film from its beginnings through Expressionism and the New Objectivity of the 1920s, the Third Reich and the period of decline, to the young German film of the 1960s; weekly film screenings, lectures, and discussions. Knowledge of German useful but not required. 3 hours or 3/4 unit.
396. **Special Topics in German Studies.** Intensive study of restricted topics in German language, literature and culture. Prerequisite: Three years of college German or equivalent. 3 hours or 3/4 unit. May be repeated as topics vary up to a maximum of 9 hours or 2 1/4 units.
400. **Beginning German for Graduate Students.** Introduction to the reading of German texts in the sciences and the humanities. 4 semester hours. No graduate credit.
401. **Readings in German for Graduate Students.** Designed for graduate students preparing for the German reading requirements for the Ph.D. Prerequisite: German 400 or equivalent. 4 semester hours. No graduate credit.
410. **Introduction to Graduate Study.** Bibliography and methodology of the study of the Germanic languages and literatures, with particular regard to German literature and Germanic linguistics; introduction to scholarship in general and the German profession in particular, including the modes and methods of scholarly endeavor. 1 unit.
415. **Middle High German.** Prerequisite: German 365. 1 unit.
420. **History of the German Language.** The internal and external history of German from prehistoric times to the present. Prerequisite: German 365 or equivalent. 1 unit.
430. **Old High German.** Grammar and interpretation of the oldest literary documents. Prerequisite: German 365. 1 unit.
435. **Old Saxon.** Synchronic-diachronic treatment of the language of the Heliand and Genesis; the position of Old Saxon in the Germanic languages with particular reference to Old High German and Old English. Prerequisite: German 430 or consent of instructor. 1 unit.

- 440. **Middle High German Literature.** Prerequisite: German 415 or equivalent. 1 unit.
- 441. **German Romanticism.** Prerequisite: Two 300-level courses in German literature, or equivalent. 1 unit.
- 442. **Nineteenth-Century German Realism.** German realism as manifested in the literature between romanticism and naturalism, with emphasis on so-called poetic realism. Prerequisite: Two 300-level courses in German literature, or equivalent. 1 unit.
- 444. **The Eighteenth Century before Goethe.** The Enlightenment and the development of the classical ideal; emphasizes the work of Gottsched, Lessing, Wieland, Klopstock, and Herder. Prerequisite: German 312 or equivalent. 1 unit.
- 451. **Naturalism, Symbolism, and Expressionism.** Same as Comparative Literature 441. Comparative analysis of German literature from the 1880s to the 1920s within the European context. Prerequisite: Two 300-level courses in German literature, or equivalent. 1 unit.
- 452. **German Literature from the Twenties to the Present.** Trends, problems, and personalities in recent German literature, including exile literature and literature of the Third Reich. Prerequisite: Two 300-level courses in German literature, or equivalent. 1 unit.
- 460. **Seminar in Older German Literature.** Topics range from the earliest known literature to the Enlightenment. Prerequisite: German 410. 1 unit. May be repeated as topics vary.
- 461. **Seminar in Modern German Literature.** Same as Comparative Literature 482. Topics range from the Enlightenment to the present. Prerequisite: German 410. 1 unit. May be repeated as topics vary.
- 463. **College Teaching of Foreign Languages.** Same as French, Russian, Spanish, and English as a Second Language 463. See French 463.
- 480. **Teaching German in College.** Introduction to the problems of teaching German in college. 1/2 unit.
- 481. **Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as French, Russian, Spanish, and English as a Second Language 481. See French 481.
- 493. **Research in Special Topics.** 1/4 to 2 units. May be repeated for a maximum of 2 units.
- 499. **Thesis Research.** 0 to 4 units

Germanic

- 367. **Introduction to Germanic Linguistics.** Same as Linguistics 367. Comparative and historical survey of the Germanic languages. Prerequisite: Completion of the foreign language requirement in the College of Liberal Arts and Sciences, or equivalent; some knowledge of German desirable. 3 hours or 3/4 unit.
- 426. **Gothic.** Synchronic and diachronic study of the Gothic language and its relationship to other Germanic and Indo-European languages; extensive reading of extant texts. Prerequisite: Germanic 367 or consent of instructor. 1 unit.
- 462. **Seminar in Germanic Linguistics.** Varying topics dealing with problems in diachronic and synchronic Germanic linguistics. Prerequisite: Consent of instructor. 1 or 2 units. May be repeated as topics vary.
- 465. **Comparative Germanic.** Reconstruction of the phonological and morphological systems of Proto-Germanic and their development into the Germanic languages and dialects. Prerequisite: Germanic 426 or consent of instructor. 1 unit.
- 467. **Runic Inscriptions.** Detailed analysis of inscriptions in the "older" Germanic futhork, the Anglo-Frisian futhorc, and the Scandinavian "younger" futharks; their relationships and the correlation between phonological and orthographic developments. Prerequisite: Germanic 465 or consent of instructor. 1 unit

Scandinavian

101. **Elementary Scandinavian, I.** The first of four semesters leading to a reading knowledge of Danish, Norwegian, or Swedish, and to an oral command of one of these languages; linguistic structure, reading, and oral practice. 4 hours.
102. **Elementary Scandinavian, II.** Continuation of Scandinavian 101. Oral practice and reading of simple texts. Prerequisite: Scandinavian 101. 4 hours.
103. **Intermediate Scandinavian, I.** Readings in Danish and Norwegian, or in Swedish; structure of Swedish, or of Danish and Norwegian. Prerequisite: Scandinavian 102 or equivalent. 4 hours.
104. **Intermediate Scandinavian, II.** Continuation of Scandinavian 103. Readings in classical and modern Danish, Norwegian, and Swedish texts. Prerequisite: Scandinavian 103. 4 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
215. **The Scandinavian Novel: Masterpieces in English Translation.** Same as Comparative Literature 215. Works by Jacobsen, Strindberg, Vesaas, Myrdal, and Nobel Prize winners Hamsun, Undset, Lagerkvist, and Johnson; readings and discussion in English. 3 hours.
293. **Honors Senior Thesis.** Prerequisite: Senior standing; consent of instructor. 1 to 2 hours.
361. **Ibsen in Translation.** Same as Comparative Literature 326. Dramas in English translation; selected works of Ibsen's Scandinavian contemporaries. 3 hours or 1 unit.
362. **Strindberg and the Later Scandinavian Dramatists in Translation.** Same as Comparative Literature 327. Major dramas and prose works of August Strindberg; selected plays by Kaj Munk, Kjeld Abell, Nordahl Grieg, and Par Lagerkvist. 3 hours or 1 unit.
390. **The Films of Ingmar Bergman.** Focuses on Bergman's major films of the late 1950s and 1960s; involves reading screenplays and extensive criticism in addition to viewing the films; and includes important artistic influences on Bergman as well as his own significance as a major twentieth-century artist. Knowledge of Swedish unnecessary. 3 hours or 3/4 unit.
396. **Special Topics in Scandinavian Studies.** Individual study in selected topics, such as individual authors, literary movements, periods, genres, or themes, and Scandinavian culture. Prerequisite: Consent of instructor. 2 to 4 hours, or 1/2 to 1 unit. May be repeated.
405. **Old Norse-Icelandic, I.** Grammar and selected readings. 1 unit. Offered in alternate years.
406. **Old Norse-Icelandic, II.** Readings; selections from the Elder Edda and the sagas. Prerequisite: Scandinavian 405. 1 unit. Offered in alternate years.

Graphic Design

(See Art and Design)

GREEK

(See Classics)

GREEK, MODERN

(See Classics)

HEALTH AND SAFETY EDUCATION

Head of Department: Professor D. B. Stone

Department Office: 120 Huff Gymnasium, 1206 S. Fourth, Champaign

Health Education

100. **Professional Seminar.** Discussions of school and community health and safety educational programs, career opportunities, and other related topics. 0 credit.
105. **Health Advocate, I.** Provides an orderly overview of skills and content relating to the areas of sexuality, drugs, alcohol, mental health, fitness, nutrition, first aid, and cardio- pulmonary resuscitation. Successful completion of the course may result in American Red Cross certification in Standard First Aid and Cardio-Pulmonary Resuscitation. 0 credit.
106. **Health Advocate, II.** Provides direct experience in the planning, implementation, and evaluation of health education programs within the student's individual living community. In addition, opportunities for experience as a peer resource person are available; the peer resource person acts as a liaison between the student and appropriate health resources, primarily McKinley Health Center. Prerequisite: Health Education 105. 4 hours.
110. **Introduction to Public Health.** Introduction to the nation's public health system; includes an overview of historical roots and organizational structure, basic research tools, concepts and scope of varied public health programs, topical treatment of major contemporary health and safety problems, and the interrelatedness of school-community functions. 3 hours.
150. **Health and Modern Life.** Dynamics of health in modern life in a rapidly changing world; modern concepts of health, disease, and longevity; current health problems, issues, and trends; scientific health facts, principles, and theories related to personal, family, and community health; and health and longevity progress in the United States. Designed primarily as a professional course for prospective health and safety educators, coaches, physical educators, and recreation workers. 3 hours.
181. **First Aid.** American Red Cross standard course in first aid. 2 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Mental Health.** Introduction to the science of mental health and illness including personality development, the genesis and manifestations of mental illness, and the maintenance of mental health; taught by a psychiatrist with emphasis on the preventive and medical aspects of mental health. 2 hours.
206. **Human Sexuality.** Offered to persons who are interested in becoming more critical and obtaining a larger perspective in their understanding of the problems of sex and family life. 2 hours.
233. **Observation and Participation in School Health Education.** Provides the student with the opportunity to gain supervised, pre-clinical experience in local schools by observing, assisting, and teaching students at the age-appropriate level for which he/she seeks certification. A minimum of sixty hours of supervised observation and/or teaching is required for successful completion of this course. Prerequisite: Health Education 150 and sophomore standing. 3 hours.
236. **Tomorrow's Environment.** Same as Environmental Studies 236. See Environmental Studies 236.
241. **Techniques of Teaching in the Secondary Schools.** Same as Secondary Education 241. See Secondary Education 241.
250. **Special Problems.** Special projects in research and independent investigation in any phase of health, physical education, recreation, and related areas selected by the students. Prerequisite: Junior or senior standing; grade-point average of 3.5; consent of faculty adviser and instructor, and approval of the head of department. 2 or 3 hours. May be repeated for a total of 4 or 6 hours.

260. **Honors Seminar.** Same as Physical Education 290 and Leisure Studies 260. See Physical Education 290.
283. **Concepts of Disease Prevention.** Introduction to the study of communicable and noncommunicable diseases in humans; includes the study of the etiology and pathogenesis of disease; host, agent, and environmental factors affecting disease occurrence; and prevention and control measures. Prerequisite: Health Education 110 and 150. 2 hours.
285. **Sex Education for Teachers.** Theory and practice of family life and sex education. Includes basic issues, philosophy, and guiding principles; state laws and their implementation; needs, justification, and objectives; curriculum in human sexuality; content knowledge, microteaching and evaluation stressing classroom techniques appropriate to sex education at various levels K-12; resource materials and their use in the classroom; and coverage of controversial topics. Prerequisite: Junior standing. 4 hours.
288. **The Secondary School Health Education Program.** Examines the secondary school health education program with an in-depth study of the three program components: health services, healthful school living, and health instruction; emphasizes the secondary school teacher's role in each of these program components, particularly health instruction. Prerequisite: Health Education 110 or consent of instructor. 4 hours.
289. **Community Health Education Internship.** Supervised field experience in official, voluntary, and professional health agencies; designed to give students in community health education work experience in actual field situations. Students work for eight weeks in University-approved health agencies for a minimum of 320 hours. Prerequisite: Senior standing or consent of instructor. 8 hours.
290. **Health Planning and Administration Internship.** Supervised field experience in official, voluntary and professional health agencies; designed to provide students in health planning and administration with work experience in actual field situations. Students complete 40 hours per week for eight weeks in university approved health agencies. Prerequisite: Senior standing and consent of instructor. 8 hours.
303. **Delivery of Health Care: Problems and Perspectives.** Same as Social Work 303. See Social Work 303.
345. **Family Planning and Population Policy.** Same as Social Work and Sociology 345. See Social Work 345.
374. **General Epidemiology.** Same as Environmental Studies, Medical Sciences, and Veterinary Pathobiology 374. The epidemiology and natural history of infectious and noninfectious diseases, including integrated vector control and host resistance, and mental health and public health. Prerequisite: Microbiology 326, Veterinary Pathobiology 332, or equivalent, or consent of instructor. 4 hours or 1 unit.
389. **Research and Evaluation in Health Education.** A study of the research literature, research designs and program evaluation models employed in health and safety education. Devotes special emphasis to developing student skills in analyzing research, assessing health behavior change and problem identification for thesis research. 2 hours or 1/2 or 1 unit.
390. **Public Health Education.** Theory and practice of community health education; adult health education through media such as radio, television, films, slides, posters, pamphlets, and newspapers; projects in preparing and using public health education materials; and evaluation of research in public health education. Prerequisite: Senior or graduate standing in health education, or consent of instructor. 3 hours or 1/2 unit.
391. **Health Data Analysis.** Introduces health data analysis, sources and uses of health data, collection techniques and classification procedures, commonly used health indices, techniques of rate adjustment, graphic presentation of data as it relates to the planning, conducting, and evaluating of public and school health education programs. Prerequisite: Educational Psychology 390 or equivalent. 3 hours or 1 unit.
392. **Health and Safety Education in the Elementary School.** Overview of the school health program to acquaint the teacher with modern concepts of health and safety

education in the elementary school; consideration of the role of the classroom teacher in understanding and meeting the health needs of children; and focus on the legal requirements for Illinois schools, major health and safety problems of elementary children, the teacher's role in the school health program, and methods and materials in teaching modern health and safety education. Prerequisite: Junior standing. 3 hours or 1/2 unit.

393. **Drug Abuse Education.** Psychosocial, pharmacological, and legal aspects of drug use and abuse; school and community responses to drug abuse; and the development of appropriate curricula, materials, and teaching strategies for combatting drug use and abuse. Prerequisite: Six hours of health education or consent of instructor. 2 hours or 1/2 unit.
394. **Special Topics.** Lecture-discussion courses in topics of current interest; see Timetable for specific subject matter. Prerequisite: Consent of instructor. 2 to 4 hours, or 1/2 to 1 unit. May be repeated to a maximum of 8 hours or 2 units.
396. **Consumer Health Education.** A study of consumerism including health products, services, information and personnel in the health care system with an emphasis on educational methods for preventing and reducing consumer misconception and exploitation. Prerequisite: Health Education 283 and senior or graduate standing. 2 hours or 1/2 or 1 unit.
397. **Health Planning.** Analysis of theory, principles and practices of health planning processes. Includes application of health planning as it relates to health systems agencies and the health care delivery system. Prerequisite: Health Education 303, 390 and 391. 2 hours or 1/2 or 1 unit.
398. **Health Administration.** Examines management principles relative to health care institutions; emphasizing goal setting, decision making, system analysis, organizational structure, conflict resolution, and leadership theories. Prerequisite: Senior or graduate standing, or consent of instructor. 3 hours or 1 unit.
400. **Scientific Foundations of Health Education.** Designed to reinforce and extend the student's knowledge of pertinent scientific health facts and principles as these apply to further improvement of personal, family, and community health. Prerequisite: Undergraduate courses beyond the elementary level in the biological and physical sciences and in health education. 1/2 or 1 unit.
401. **Issues in Health Education.** Analyzes current developments, trends, and controversies in health education from a historical perspective, with emphasis on developing student competencies for issue analysis; assesses the effect of philosophical, scientific, political, and legislative initiatives on professional practice; and examines issues affecting the health educator in various work settings, including occupational health and safety, patient care, public health, school health, and higher education. 1/2 or 1 unit.
403. **Problems in Public Health Education.** Basic facts and principles of public health at the local, state, and national levels, including the relationships between public health departments, voluntary health agencies, and the school health program. 1/2 or 1 unit.
404. **Trends and Issues in Sex Education.** Critical analysis of current trends and basic issues of sex education; study of present status of sex education in the United States and selected foreign countries; and a critical analysis of philosophy, principles, methods, and current problems in sex education. Prerequisite: Undergraduate courses beyond the elementary level in the biological and social sciences, Health Education 285 or equivalent, or consent of instructor. 1/2 or 1 unit.
489. **Community Health Education Internship.** Supervised field experience in official, voluntary and professional health agencies; designed to provide students in community health education with work experience in actual field situations. Students work for one semester in a University approved health agency. Prerequisite: Health Education 303, 374, 390, 391 and 403 and graduate standing in Community Health. 2 units.
490. **Seminar.** Critical evaluation of research studies in health and safety education, emphasizing research methods and experiment design and analysis; review of

- statistical techniques in factorial and correlational studies; and student reports of thesis literature reviews and research procedures. Prerequisite: Master's thesis. 1/2 unit. May be repeated to a maximum of 1 unit.
493. **Special Projects.** Independent research on special projects. Prerequisite: Educational Psychology 390, Physical Education 495, and Health Education 400 or equivalent. 1/2 to 2 units. May be repeated to a maximum of 2 units.
494. **Special Topics in Health Education.** Lectures on topics of current interest. 1/2 or 1 unit.
499. **Thesis Research.** Preparation of theses in health and safety education. 0 to 4 units

Safety Education

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
270. **Safety Education in the Elementary School.** Uses a self- instructional package to provide the student with an awareness of safety problems of young children; includes human control over accidents, developing responsibility for safe environments, learning strategies in safety education, and familiarization with Safety Education Units for Illinois Elementary Schools for grades K-6. Quiz and discussion. 2 hours.
280. **Safety Education.** Understanding and appreciating the place of safety in modern life; the teaching of safety in the elementary and secondary schools; need for psychological considerations; planning and methods of teaching; safe school environment and liability; materials; safety education for elementary and secondary schools; a safety program for areas outside the school; human experience; and testing and evaluating. 3 hours.
284. **Driver Education.** Cause and extent of highway accidents; laws and regulations; method of instructing high school students in the proper attitudes, habits, and skill in driving; demonstrations and practice in the use of a dual control car; and psychophysical testing equipment. Prerequisite: Up-to-date driver's license; junior standing; proficiency in driving automatic and standard transmission vehicles. 3 hours.
289. **Occupational Health and Safety Internship.** Supervised field experience in industrial, educational, or community safety agencies; designed to give students in safety education work experience in actual field situations. Students work for a minimum of 320 hours in University-approved safety departments or agencies. Prerequisite: Senior standing in health and safety education. 8 hours.
294. **Instructional Methods in Driver Education.** Provides advanced preparation in principles and practices of teaching driver safety education; includes the acquisition of skills in curriculum development and the use of multimedia teaching techniques with laboratory experiences in simulated driving systems, multiple-car range facilities, and electronic classroom systems. Prerequisite: Safety Education 284. 4 hours.
385. **Psychology of Traffic Safety: Study of the Accident Process and Driver Controls.** Epidemiologic and accident proneness concepts, traffic accident data description, reporting procedures, case studies, accident reconstruction, causal analysis, on-site data collection and analysis, driver- pedestrian observation techniques, evaluation of the effectiveness of driver education, licensing, and legal sanctions; includes field study. 4 hours or 1 unit.
394. **Special Topics.** Lecture and laboratory experiences of current interests and issues; specific subject matter will be announced in the Timetable. 2 to 4 hours, or 1/2 to 1 unit. May be repeated to a maximum of 8 hours or 2 units.
395. **Safety Management.** Industrial accident prevention from a statistical, historical, epidemiological, and primarily a management viewpoint; organizational and administrative aspects of management practices related to the development of safety programs, including practical approaches such as the use of safety committees and the control of hazards through systems analysis, employee selection and training, and design of equipment and work places. Prerequisite: Safety Education 280 and either

Health Education 391 or Educational Psychology 390, or equivalent. 2 hours or 1/2 unit.

493. **Special Projects.** Individual student projects in safety education and accident prevention which may consist of a critical review of literature on a specified topic, analytical evaluations, development of new curriculum materials, or experimental study; involves the preparation of a final report. Prerequisite: Consent of instructor. 1/2 or 1 unit.
494. **Special Topics in Safety.** Lectures on topics of current interest. 1/2 or 1 unit

HEBREW

(See Linguistics)

HINDI

(See Linguistics)

HISTORY

Chairperson of Department: Professor R. W. Burkhardt
Department Office: 309 Gregory Hall, 810 S. Wright, Urbana

111. **Western Civilization from Antiquity to 1660.** The fundamental developments--social, economic, cultural, intellectual, and political--in the history of mankind and Western society before 1660; includes the Greek and Roman world, the German migrations, the rise of cities and the commercial revolution, medieval art, universities, and heresies, the Renaissance and Reformation, the Puritan Revolution, and the beginnings of the modern world. 4 hours.
112. **Western Civilization from 1660 to the Present.** The fundamental developments--social, economic, cultural, intellectual, and political--in the history of mankind and Western society since 1660; includes the rise of modern science, the French and Industrial revolutions, the Romantic movement, the growth of nationalism and socialism, imperialism, urban growth, the Russian Revolution, Nazi Germany, the world wars, and the West and the underdeveloped world. 4 hours.
131. **History of England to 1688.** Survey of the political and constitutional, social and economic, church and cultural, and imperial history of the British people from the beginning of English history through the revolution of 1688. 4 hours.
132. **History of England, 1688 to the Present.** Survey of the political and constitutional, social and economic, diplomatic and imperial, and cultural history of the British people from 1688 to the present. 4 hours.
151. **History of the United States to 1877.** Colonial foundations, movement for independence, and early years of the republic. Students are not given credit for both History 151, and History 260 and 261. 4 hours.
152. **History of the United States, 1877 to the Present.** A century of national life and organization. Students are not given credit for both History 152 and 262. 4 hours.
168. **Indian Civilization and Society.** Same as Anthropology 168. See Anthropology 168.
169. **South Asia in the Modern Period.** Same as Anthropology 169. Interdisciplinary introduction to modern South Asian history and society. 4 hours.
171. **History of East Asia, I.** Survey of the development of Chinese and Japanese history, civilization, and institutions prior to the seventeenth century. 4 hours.

172. **History of East Asia, II.** Survey of China and Japan in modern times with particular reference to the modernization and revolutionary processes in East Asia. Prerequisite: History 171 or consent of instructor. 4 hours.
173. **Islamic History and Civilization in the Near and Middle East to 1700.** Development of Islamic beliefs, institutions, and culture in the nuclear Islamic region (the present area of the Arab countries and Israel, Iran, and Turkey) from Mohammed to the age of European expansion. 4 hours.
174. **Islamic History and Civilization in the Near and Middle East Since 1700.** Islamic civilization since the age of European expansion; imperialism, Westernization, nationalism, and modernization. Arab countries, Israel, Iran, and Turkey are covered. 4 hours.
175. **Latin America from Conquest to Independence.** Survey of Latin American history from the discovery of America to 1824. 3 hours. Credit may not be received for both History 175 and 275.
176. **Modern and Contemporary Latin America.** History of the Latin American republics from their independence to the present; emphasis on Argentina, Brazil, Chile, Colombia, Cuba, and Mexico. 3 hours. Credit may not be received for both History 176 and 275.
181. **The Ancient World.** Ancient empires and Greece. 3 hours.
182. **The Ancient World.** Rome. 3 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
198. **Freshman Seminar.** Through research, reports, and discussion in a selected field of historical study, the seminar provides an in-depth understanding of the problems of that field and of the methodology of history as a discipline. Prerequisite: James Scholar standing or other designation as a superior student; consent of instructor. 3 to 4 hours. May be repeated to a total of 6 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
203. **The Age of Localism: The Early Middle Ages.** The failure of imperial Rome and the rise of the Church; the organization of European society on a local basis through manorialism and feudalism. 3 hours.
204. **The Revival of Europe: The High and Later Middle Ages.** The revival of the economy; the expansion of Europe; and the rise of national states. 3 hours.
211. **The Contemporary World: Political, Ideological, and International Forces.** Interpretation of the contemporary world covering the legacy of imperialism, militarism, and world politics, the revolt of the masses, the totalitarian state, nationalism, internationalism, and such related topics. 3 hours.
212. **The Contemporary World: Economic, Social, and Cultural Aspects.** Interpretation of the contemporary world covering the economics of global power, ideological and social forces, the individual and the modern mind, the collective society, the personality in history, and such related topics. 3 hours.
213. **The Third World in Contemporary History.** Surveys the years from the close of the nineteenth century to the present, specifically the developments in Africa, Asia, Latin America, and the Middle East that led to the emergence of the "Third World." 3 hours.
215. **History of North and West Africa.** Survey of major themes and events in the history of North and West Africa from prehistoric times and the peopling of Africa through the advent of Islam; North and West African empires and states in the medieval period; the arrival and departure of European colonial powers; and the re-emergence of independent African states. 3 hours.
216. **History of East and Southern Africa.** Survey of major themes and events from the Bantu migrations and the rise of Aksum through the development of states and empires, Islam, the expansion of trade, European colonial rule, nationalism, and the persistence of white domination in the south. 3 hours.

219. **Survey of Russian History from Early Times to the Present.** Main themes and problems of Russian history from earliest times to the present. 3 hours.
222. **Traditional China.** Historical background to the modern age, tracing the Chinese state and empire from the earliest times until 1644 A.D. Basic political, social, and economic patterns; cultural, intellectual, and technological achievements; and China's impact on Asia and the world. 3 hours.
224. **Chinese Thought from Confucius to Mao.** Same as Religious Studies 224. Examination of China's principal philosophical, religious, and political schools of thought--such as Confucianism, Taoism, Zen Buddhism, and Maoism--as ways of understanding one of the world's major civilizations; the period of the classical philosophers, the glory years of empire, and the troubled era of western contact receive approximately equal attention. 3 hours.
230. **Modern Business History.** Historical development of business enterprise from the early modern era to the present in broad international perspective; social and cultural values in business activity; business, government, and social responsibility; and theories of entrepreneurial behavior and detailed case studies of great business leaders. Prerequisite: Sophomore standing. 3 hours.
237. **Contemporary Western Europe.** Same as Economics 237. An interdisciplinary approach to contemporary Western Europe; cultural, historical, economic, political, and social topics; and postwar issues, including economic recovery, position of Western Europe between the United States and the Soviet Union, economic and political integration, and current policy problems. Prerequisite: Sophomore standing. 3 hours.
247. **Science in Western Civilization, I.** The intellectual and social history of science from antiquity through the Enlightenment; special emphasis on the scientific revolution of the seventeenth century. 3 hours.
248. **Science in Western Civilization, II.** Topics in the intellectual and social history of modern science, 1789 to the present. 3 hours.
249. **History of Medicine.** Rise and development of medicine in the West since the sixteenth century; interrelations of physiology, pathology, and social demands with the theory and practice of medicine; patterns of professionalization; social role of the physician; conflict among ideas of medicine as an art, a science, and a social service; and problems of mental illness, medical ethics, and nontraditional forms of practice. Prerequisite: One year of college biology or chemistry, one year of college history, or consent of instructor. 3 hours.
253. **Afro-American History to 1877.** Same as Afro-American Studies 253. History of Africans in the Americas, surveying the African slave trade, slavery in the European colonies of the Americas, early United States slavery, and the Afro-American in the Civil War and Reconstruction. 3 hours.
254. **Afro-American History Since 1877.** Same as Afro-American Studies 254. History of Afro-Americans in the age of white supremacy; the rise of modern protest organizations; the era of integration; and the black power movement. 3 hours.
260. **Colonial Beginnings and Early United States History to 1815.** Social, economic, and political survey of the region and its relation to the evolving Atlantic community. Credit is not given for both History 260 and 151. 3 hours.
261. **The United States in the Nineteenth Century.** History of the United States from 1815 to 1900. Credit is not given for both History 261 and 151. 3 hours.
262. **The United States in the Twentieth Century.** One major emphasis on foreign policy, including the emergence of the United States as a great power after 1898; a second emphasis on the Progressive movement and recurrent attempts at the reform of American society; and racial and urban problems and the conservation of natural resources included. Credit is not given for both History 262 and 152. 3 hours.
265. **Europe and the Romantic Revolution, 1770-1850.** Examines Romanticism as a basic psychological orientation that received its first elaborate cultural development and historical definition in the period indicated; treats various aspects of human activity, such as love, heroism, nature worship, morbidity, social idealism, and

nationalism from the standpoint of the Romantic Movement. Prerequisite: Sophomore standing or consent of instructor. 3 hours.

271. **The Canadian Frontier, 1500-1778.** French, Indian, British, and Americans in Canada and the Trans-Appalachian West from the sixteenth century to the eighteenth century. Prerequisite: One year of college history. 3 hours.
273. **The History of American Women: Colonial Period to the Present.** Focuses on the changing legal, political, economic, and social status of women in the United States and the complex factors affecting change; includes a consideration of family life; and combines chronological and topical approaches. 3 hours.
274. **United States and World Crisis, 1917 to Present.** History of American foreign relations since World War I. 3 hours.
275. **Themes and Issues in Latin American History.** A thematic survey of major Latin American issues, trends, and events from the colonial period through the modern era. 3 hours. Credit may not be received for both History 275 and 175 or 176.
281. **War, Military Institutions, and Society to 1815.** Land and naval warfare from prehistory to Napoleon; discusses traditional topics such as technology, tactics, and strategy at length and demonstrates how military institutions are integrated with society as a whole. 3 hours.
282. **War, Military Institutions, and Society Since 1815.** Land and naval warfare since Napoleon; technology, tactics, strategy, administration, and military institutions in themselves and as they relate to western and nonwestern societies; and conventional and nuclear warfare. 3 hours.
290. **Individual Study.** Readings in selected fields in consultation with the instructor. Prerequisite: Junior or senior of high standing; written consent of the honors adviser. 2 to 4 hours.
293. **Honors Senior Thesis.** Two-semester research project. Prerequisite: History concentrator with senior standing and 4.5 grade point average; written consent of supervising professor and honors adviser. May be taken by honors students in partial fulfillment of department honors requirements. 3 hours. Must be repeated for a total of 6 hours.
296. **Special Topics.** Topics are given on an experimental one- time-only basis. 3 hours.
298. **Colloquium in History.** Prerequisite: Junior standing. History concentrators and social studies teacher trainees have priority in enrolling for this course. 3 hours. May be repeated as topics vary to a maximum of 6 hours.
300. **Evolutionary and Social Thought Since 1800.** Studies evolutionary theory, the scientific and social contexts in which it has developed, and the inferences drawn from it concerning man's nature and function. 3 hours, or 1/2 or 1 unit.
301. **History of Poland to 1795.** Comprehensive survey from prehistoric beginnings through the Golden Age to the disappearance of the Polish state; attention to economic, social, and cultural as well as political themes. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
303. **The Near and Middle East in the Twentieth Century.** Great power diplomacy, imperialism, nationalism, and problems of modernization studied through coverage of Arab states and Israel, Turkey, and Iran. Prerequisite: One year of college history or political science, or consent of instructor. 3 hours, or 1/2 or 1 unit.
304. **Medieval Civilization.** Same as Religious Studies 304. The architectural, artistic, philosophical, political, and religious components of medieval culture, thought, and patterns of behavior; includes monasticism and society and the individual. Prerequisite: Sophomore standing or consent of instructor. 3 hours, or 1/2 or 1 unit.
305. **The Age of the Renaissance.** Same as Religious Studies 305. Prerequisite: One year of college history. 3 hours, or 1/2 or 1 unit.
306. **The Age of the Protestant and Catholic Reformation, 1500- 1648.** Same as Religious Studies 306. Prerequisite: One year of college history. 3 hours, or 1/2 or 1 unit.
307. **Islam and the Near and Middle East from Mohammed to 1258.** Same as Religious Studies 307. The Koran and the Prophet; rule from the Atlantic Ocean to

- India; Arab and Persian Muslims; caliphate and sultanate; law, theology, mysticism, and heresies; Crusades; trade and commerce; and intellectual and cultural achievements. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
308. **The Europeanization of the Near East, 1768-1914.** Prerequisite: One year of college history. 3 hours, or 1/2 or 1 unit.
309. **Development of Modern Europe: Absolutism and Colonial Expansion, 1648-1789.** Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
310. **Europe in the Age of the French Revolution and Napoleon.** Comparative survey of Western countries in the age of democratic upheavals: America, England, and Prussia as well as France; the rise of Napoleon and the response of Europe; and the fate of innovation and reform in the immediate aftermath of the Napoleonic Wars. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
311. **European History from 1815 to 1871.** A synthesis of politics, economics, and culture; revolutions, reaction, liberalism, conservatism, socialism, nationalism, romanticism, and realism. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
312. **European History from 1871 to 1918.** A synthesis of politics, economics, and culture; new state systems, long depression, imperialism, racism, nationalism, imperialism, symbolism, fin de siècle, socialism, and World War I. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
313. **European History from 1918 to 1939.** Survey of European society from 1918 to 1939, with emphasis on the impact of World War I, the Russian Revolution, fascism, and the intellectual trends of the twenties and thirties. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
314. **European History from 1939 to the Present.** Survey of European society since 1939, with emphasis on the impact of World War II, the Cold War, the establishment of the welfare state, and social developments. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
316. **The Industrial Revolution in Europe, 1780-1900.** Comparative analytic study of industrial development in England, France, Germany, and Russia; social, cultural, and demographic consequences of rapid economic change. 3 hours, or 1/2 or 1 unit.
317. **Europe and the World Economy Since 1880.** Economic development of Europe within world economy to the present; topics include imperialism and international finance; World War I and Great Depression; Soviet development; recovery since 1945; and Europe and the underdeveloped world. 3 hours, or 1/2 or 1 unit.
318. **European International Affairs, 1815-1914.** The history of European international affairs from the Vienna Congress to the First World War, with the main focus on political developments, but with considerable attention also paid to the influence of domestic politics and social and economic changes on foreign policy. Prerequisite: One year of college history or consent of instructor. 3 hours or 1/2 or 1 unit. A critical bibliographical essay on a major point of historical controversy must be written by the student for 1 unit of credit.
319. **European International Affairs, 1914 to the Present.** The history of European international affairs from the First World War to the present day, concentrating on political developments, especially the two world wars, but including the impact of domestic politics, ideological struggle, and socio-economic change upon foreign policy. Prerequisite: One year of college history or consent of instructor. 3 hours or 1/2 or 1 unit. A critical bibliographical essay on a major point of historical controversy must be written by the student for 1 unit of credit.
320. **Russia from the Earliest Times to Peter the Great.** Political, economic, cultural, and social development of Russia during the Kievan and Muscovite periods. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.

321. **Social History of Imperial Russia.** Social change during Russia's emergence as a modern western nation; evolution of the monarchy, clergy, townspeople, intelligentsia, and peasantry from 1700 to 1905 with special attention to the links among family, social estate, and the larger society. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
323. **Intellectual History of Modern Europe, 1513-1770.** Survey of the seminal ideas in the fields of political, social, and economic thought which have influenced the development of modern Europe. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
324. **Intellectual History of Modern Europe, 1770 to the Present.** Survey of the seminal ideas in the fields of political, social, and economic thought which have influenced the development of modern Europe. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
325. **Southern Africa: Race and Power.** Same as African Studies 325 and Political Science 333. See African Studies 325.
326. **Intellectual and Cultural History of Russia.** Survey of major themes in the development of Russian culture and thought, with emphasis on the nineteenth and twentieth centuries. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
327. **Revolutionary Russia, 1904-1939.** Russia and its empire from the Russo-Japanese War and the Revolution of 1905 through World War I, the Revolutions of 1917, the early years of the Soviet system, the rise of Stalin, and the Great Purge. Prerequisite: One year of college history or political science, or consent of instructor. 3 hours, or 1/2 or 1 unit. Term paper required for 1 unit credit.
328. **Soviet Russia since 1939.** The multinational Soviet state from the Hitler-Stalin Pact through World War II, the postwar Stalin era, the emergence and dominance of Khrushchev, and the Brezhnev era to the present day. Prerequisite: One year of college history or political science, or consent of instructor. 3 hours, or 1/2 or 1 unit. Term paper required for 1 unit credit.
329. **Southeastern Europe, 1700-1918.** The political, economic, and cultural development of the Rumanians, South Slavs, Greeks, and Albanians; the impact of Ottoman rule; the rise of nationalism and the formation of national states; and the Orthodox Church. Prerequisite: One year of college history or consent of instructor. 3 hours or 1 unit.
330. **Eastern Europe, 1919 to the Present.** The political, economic, and cultural history of Poland, Czechoslovakia, Hungary, Rumania, Yugoslavia, Bulgaria, Greece, and Albania; particular emphasis upon the post-World War II era. Prerequisite: One year of college history or consent of instructor. 3 hours or 1 unit.
331. **Medieval Economic and Social History.** Includes the decline of Roman society, the age of localism, the revival of commerce and urbanism, medieval capitalism, and economic decline and social turmoil. Prerequisite: One year of college history or consent of instructor. 3 hours or 1 unit.
332. **Medieval England.** Economic, intellectual, religious, and social developments as reflected in the art and architecture of medieval England from the time of the German invasions to about the fifteenth century. Prerequisite: Sophomore standing or consent of instructor. 3 hours, or 1/2 or 1 unit.
333. **England under the Tudors and Stuarts, 1485-1660.** Politics, religion, and society in the era of the Protestant Reformation and the Civil War. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
334. **Great Britain Under the Later Stuarts and the Hanoverians, 1660-1815.** Principal political, economic, social, religious, and cultural developments in British history from the Restoration to the end of the Napoleonic wars. Prerequisite: One year of college history. 3 hours, or 1/2 or 1 unit.
335. **France, 1815-1900.** The development of France in its various aspects, with special attention to social problems. 3 hours, or 1/2 or 1 unit.

336. **France, 1900 to the Present.** Political, diplomatic, economic, social, and intellectual developments in France from 1900 to the present. Prerequisite: One year of history or political science. 3 hours, or 1/2 or 1 unit.
337. **Economic History of American Agriculture.** Same as Agricultural Economics and Economics 337. See Agricultural Economics 337.
338. **History of Biology.** Same as Biology 338. Development of biological thought from antiquity to the present, emphasizing evolutionary theory and physiology in the nineteenth century and genetics in the twentieth century. Prerequisite: One year of college biology or history, or consent of instructor. 3 hours, or 1/2 or 1 unit.
339. **Scientific Thought, I.** Same as Philosophy 317. See Philosophy 317.
340. **Scientific Thought, II.** Same as Philosophy 318. See Philosophy 318.
341. **Modern Britain: the Victorian Era, 1815-1900.** History of the political, constitutional, social, economic, and diplomatic developments of the United Kingdom, including Ireland. Prerequisite: One year of college history. 3 hours, or 1/2 or 1 unit.
342. **Modern Britain Since 1900.** History of the political, constitutional, social, economic, and diplomatic developments of the United Kingdom, including Ireland. Prerequisite: One year of college history. 3 hours, or 1/2 or 1 unit.
343. **The Turks and the Ottoman Empire, 1100-1566.** Turkish migrations; the Crusades; Genghis Khan and the Mongols; Seljuks of Rum; Ottoman expansion; Islamic mysticism and law; society and economy; and international trade routes in the Black Sea and eastern Mediterranean. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
344. **The Ottoman Empire, 1566-1924.** Economy, society, law, and government; the Ottomans and Mediterranean society; Ottoman culture and Islamic tradition; minorities; trade, diplomacy, and capitulations; "cline" and dismemberment; and traditional and westernizing attempts at revival. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
345. **Constitutional and Legal History of Medieval England.** The origin and development of fundamental English legal and constitutional ideas and institutions in response to changing social needs: the inquest, the grand and petty juries, civil and criminal procedures, and the beginnings of representative government. Valuable for those who intend to study law. Prerequisite: Sophomore standing or consent of instructor. 3 hours, or 1/2 or 1 unit.
346. **Constitutional and Legal History of Modern Britain.** The impact of continuing industrial and social change on English law and the constitution; marriage; civil liberties; from women's burden to women's rights; adaptation of English legal ideas to the American scene; and evolution to the present democracy. Valuable for those who intend to study law. Prerequisite: Sophomore standing or consent of instructor. 3 hours, or 1/2 or 1 unit.
350. **History of American Immigration to 1880.** The migrations which peopled Colonial America and the United States and their role in the shaping of American society and culture; research opportunities provided. Prerequisite: Junior standing. 3 hours, or 1/2 or 1 unit.
351. **History of American Immigration Since 1880.** The migrations of the late nineteenth and twentieth centuries and their impact on American society and culture. Prerequisite: Junior standing. 3 hours, or 1/2 or 1 unit.
352. **Colonial Beginnings of American Life and Institutions.** Study of the seventeenth- and eighteenth-century colonies to 1763. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
353. **Afro-American Intellectual History.** Same as Afro-American Studies 353. Africa's importance in Afro-American thought; the ideology of liberation strategies; religion; education; and artistic expression, particularly the Harlem Renaissance, New Deal, and cultural manifestations of the 1960s and 1970s. Prerequisite: History 253 or 254, or one year of American history, or consent of instructor. 3 hours, or 1/2 or 1 unit.
354. **The Era of the American Revolution, 1763-89.** Prerequisite: One year of college history. 3 hours, or 1/2 or 1 unit.

355. **Federalists, Jeffersonians, and the Era of Good Feeling.** United States history from 1789 to 1828, with emphasis on the conflict between nationalism and sectional interests. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
356. **America in the Age of Jackson.** Political, social, and cultural study of the United States from the 1820s to the 1850s, including the humanitarian reform movements, manifest destiny, and the Mexican War. 3 hours, or 1/2 or 1 unit.
359. **Civil War and Reconstruction.** The United States between 1850 and 1877, with emphasis on the causes of the war, wartime problems of the North and South, and efforts to create a new Union after the war. 3 hours, or 1/2 or 1 unit.
360. **History of the United States, 1877-1909.** Prerequisite: One year of college history, political science, or economics. 3 hours, or 1/2 or 1 unit.
361. **History of the United States, 1909-1932.** Prerequisite: One year of college history, political science, or economics. 3 hours, or 1/2 or 1 unit.
362. **History of the United States since 1932.** Discusses the New Deal, the Cold War, all the presidents since Roosevelt, the structure of American imperialism, and America's role in world politics. Prerequisite: One year of college history, political science, or economics. 3 hours, or 1/2 or 1 unit.
363. **Social History of Industrial America to 1918.** The impact of industrialization, immigration, and urbanization on American society to the end of World War I. Prerequisite: One year of college history. 3 hours, or 1/2 or 1 unit.
364. **Social History of Industrial America Since World War I.** Study of the impact of industrial technology, business enterprise, immigration, and urbanization of American society. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
365. **The History of Illinois to 1900.** The development of Illinois, first as a region and then as a state, with emphasis upon its political, economic, social, religious, and cultural growth in the eighteenth and nineteenth centuries. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
366. **The History of Illinois in the Twentieth Century.** The development of a modern American state in the twentieth century with emphasis upon its political life, economic growth, social and intellectual problems, and contribution to the nation. Includes Chicago's expanding role in the history of Illinois. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
367. **The Trans-Mississippi West.** The West in American history since the Louisiana Purchase; western stereotypes, order and violence, racial minorities, the urban sector, natural resources, and environmental policy. 3 hours, or 1/2 or 1 unit.
368. **The South in American History.** Same as Afro-American Studies 368. Exploration of the history of the American South identifying and explaining differences between the South and the rest of the nation; examines the correlates of economic change in the realms of politics, social structure, and cultural values. Race relations provides a central theme of the course. 3 hours, or 1/2 or 1 unit.
369. **Constitutional Development of the United States to 1865.** Prerequisite: One year of college history or political science. 3 hours, or 1/2 or 1 unit.
370. **Constitutional Development of the United States Since 1865.** Prerequisite: One year of college history or political science. 3 hours, or 1/2 or 1 unit.
371. **American Intellectual and Cultural History to 1865.** Same as Religious Studies 381. Examines the role of religious, scientific, political, social, educational, and artistic thought and institutions in shaping a distinctive American culture, emphasizing Puritanism, the Enlightenment, and the Romantic movement. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
372. **American Intellectual and Cultural History since 1859.** Same as Religious Studies 382. Treats the leading intellectual and cultural influences in shaping modern and contemporary America, emphasizing the impact of Darwinism and naturalistic thought, science and technology, the American university, divisions in religious thought (Modernism, Fundamentalism, Neo-Orthodoxy), the

Counterculture, and the New Conservatism. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.

373. **History of American Foreign Relations to 1917.** 3 hours, or 1/2 or 1 unit.
374. **Imperialism, 1870 to the Present.** Deals thematically with controversial issues concerning imperialism in the past century; includes various theories on the origins of imperialism, the diverse character of European empires before 1914, the impact of the world wars on empire, and American and Soviet "imperialism" since World War II. Prerequisite: One year of college history or political science. 3 hours, or 1/2 or 1 unit.
375. **Andean Countries of South America, 1532 to the Present.** The history of Colombia, Ecuador, Peru, Bolivia, and Chile; emphasizes common problems and diverse responses, from the conquest in the sixteenth century to the struggles for development in the twentieth. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
376. **Reform and Revolutionary Movements in Twentieth-Century Latin America.** Comparative historical treatment of mass political movements in twentieth-century Latin America stressing Chile, Peru, Brazil, Argentina, Mexico, Bolivia, and Cuba; social science concepts supplement the historical analysis of causes, leaders, followers, programs, tactics, and results of these movements. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
377. **History of Modern Brazil, 1808 to the Present.** Problems of a neocolonial society; themes include family structure, slavery, imperialism, modernization, and the crisis of traditional institutions. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
378. **History of Mexico, 1519 to the Present.** The development of Mexico from the conquest to the postrevolutionary present. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
379. **Slavery and Race Relations in Latin America.** Same as Afro-American Studies 379. Selected topics on Indians and Spaniards, whites and blacks, emphasizing Mexico, the Caribbean, and Brazil. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
380. **Europe and the 'Scramble for Africa.** Analysis of the politics and economics of the European partition of Africa with particular reference to Britain, France, and Germany (1870-1900) and African responses to alien rule. Prerequisite: One year of college history. 3 hours, or 1/2 or 1 unit.
381. **Ancient Greek States.** History of the Greek states from the earliest times to 334 B.C. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
382. **Alexander and His Successors.** Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
383. **History of the Roman Republic to 44 B. .** Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
384. **The Roman Empire.** Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
385. **African Independence and Underdevelopment: 1945 to the Present.** Same as Political Science 332. Historical investigation of African political economies based on selected case studies; includes development of the colonial economy, economic bases of African nationalism, and postindependence underdevelopment and attempts to escape from it. Prerequisite: One year of college history or enrollment in the African Studies program. 3 hours, or 1/2 or 1 unit. To receive 1 unit of credit graduate students must write a research paper in addition to fulfilling all other course requirements.
386. **Topics in African History.** Considers specific problems such as traditional histories, social structure and state formation, religious movements, elites and reactions to European occupation, urbanization, nationalism, and the colonial legacy. Prerequisite: One year of college history or enrollment in the African Studies program. 3 hours, or 1/2 or 1 unit.
387. **Indian History and Civilization to 1707.** Development of Indian civilization to the British conquest; political evolution, religious and philosophical systems, society, art,

- and literature during Hindu and Muslim periods. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
388. **India from Colony to Nation.** Mughal Empire and British Raj, Indian national awakening, and struggle for independence under Ghandi and Nehru. 3 hours, or 1/2 or 1 unit.
390. **China Under the Ch'ing Dynasty.** The period of Manchu domination in China (1644-1912); emphasis on Chinese reactions to Western influences during the nineteenth century. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
391. **History of Blacks in Urban America.** A survey of historic conditions of Afro-Americans in nineteenth and twentieth century cities; an examination of Black life, slave and free, in antebellum cities, migration patterns, the origins of the ghetto, ethnic conflicts, socio-economic patterns of urban Blacks, community institutions, political participation, urban policy issues, and social and demographic effects of urbanization. Prerequisite: One year of college history or consent of instructor. 3 hours or 1/2 or 1 unit.
392. **Topics in Afro-American History.** Examines significant issues, topics, themes, and controversies in the history of Black Americans and analyzes specialized studies in Afro- American historiography. Prerequisite: History 253 and 254, one year of American history, or consent of instructor. 3 hours, or 1/2 or 1 unit. Students do a term paper for 1 unit of credit.
393. **Social-Economic History of Modern China.** Disintegration of traditional social and economic systems during the nineteenth and twentieth centuries, and the political effects of that disintegration; examines changes in the agricultural economy, changing rural elites, urbanization, and emergence of new social classes. It is recommended that students take History 390 and 394 before enrollment in History 393. 3 hours, or 1/2 or 1 unit.
394. **Twentieth-Century China.** Chinese state and society in revolutionary transition; emphasis on the Nationalist and Communist revolutions and their results. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
395. **Premodern Japan.** Japanese history from its origins to 1800; evolution of the traditional society, stressing institutional and cultural problems of ancient and "feudal" Japan. 3 hours, or 1/2 or 1 unit.
396. **Modern Japan.** Japanese history since 1800; institutional and cultural problems connected with modernization; continuity and change in the traditional order; Western pressure; the Meiji restoration; rise and fall of empire; and creation of a modern society. 3 hours, or 1/2 or 1 unit.
397. **History of Spain and Portugal.** Iberian history from pre- Roman times to the present with emphasis on the modern period. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
398. **The Habsburg Monarchy, 1526-1792.** A history of the Habsburg Monarchy from the union of Austria, Bohemia, and Hungary to the end of the period of reform. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
399. **The Habsburg Monarchy, 1792-1918.** Social, cultural, economic, and political development; evolution of the central institutions of the monarchy and the monarchy's place in the European state system; and internal history of the constituent peoples of the monarchy: Germans, Magyars, Czechs, Slovaks, Poles, Slovenes, Croats, Serbs, Ruthenians, and Rumanians. Prerequisite: One year of college history or consent of instructor. 3 hours, or 1/2 or 1 unit.
411. **Seminar in Ancient History: Greece.** 1 unit.
413. **Seminar in Ancient History: Rome.** 1 unit.
415. **Seminar in Medieval History.** 1 unit.
417. **Seminar in Renaissance History.** 1 unit.
419. **Seminar in European History, 1648 to 1815.** 1 unit.
421. **Seminar in European History Since 1815.** 1 unit.

- 423. **Seminar in English History to 1688.** 1 unit.
- 425. **Seminar in English and British Empire History Since 1688.** 1 unit.
- 427. **Seminar in Russian History.** 1 unit.
- 441. **Seminar in Near and Middle Eastern History.** 1 unit.
- 443. **Seminar in South Asian History.** 1 unit.
- 445. **Seminar in East Asian History.** 1 unit.
- 448. **Seminar in African History.** Prerequisite: History 215, 216, and one upper-level African history course. 1 unit.
- 451. **Seminar in Early American History to 1789.** 1 unit.
- 453. **Seminar in American History Since 1789.** 1 unit.
- 461. **Seminar in Latin American History.** 1 unit.
- 471. **Seminar in the History of Science.** 1 unit.
- 472. **Seminar in History of Medicine: Selected Topics from Antiquity to the Present.** 1 unit.
- 475. **Problems in Ancient History.** 1 unit.
- 476. **Problems in Medieval History.** 1 unit.
- 477. **Problems in Early Modern European History, 1300-1815.** 1 unit.
- 478. **Problems in European History since 1815.** 1 unit.
- 479. **Problems in English History before 1688.** 1 unit.
- 480. **Problems in English History since 1688.** 1 unit.
- 481. **Problems in Russian History.** 1 unit.
- 482. **Problems in Military History.** Prerequisite: Graduate Standing. 1 unit.
- 483. **Problems in Chinese History.** 1 unit.
- 484. **Problems in Japanese History.** 1 unit.
- 486. **Problems in American History to 1830.** 1 unit.
- 487. **Problems in American History since 1815.** 1 unit.
- 488. **Problems in Latin American History.** 1 unit.
- 489. **Problems in African History.** 1 unit.
- 490. **History and Social Theory.** Introduces theories and concepts in the social sciences used in historical research. Prerequisite: Admittance to the Ph.D. program. 1 unit.
- 495. **Individual Research Project.** Directed research in special fields; may be taken in lieu of seminars in fields in which seminars are seldom offered. 1 unit.
- 496. **History of Historiography.** Introduction to the great historians from early times to the present. 1 unit.
- 497. **Reading Course.** Directed reading in special fields. Open only to students with a master's degree or equivalent, who are preparing for the preliminary examination in history and who need instruction in areas not provided by current course offerings. Prerequisite: Master's degree or equivalent; consent of instructor. 1 unit.
- 498. **Problems in the Teaching of College History.** Prerequisite: Candidate for Ph.D. degree in history. 1/2 unit.
- 499. **Thesis Research.** Individual direction in research and guidance in writing theses for advanced degrees. 0 to 4 units

HISTORY OF ART

(See Art and Design)

HORTICULTURE

Head of Department: Professor W. L. George, Jr.

Department Office: 124 Mumford Hall, 1301 W. Gregory Dr., Urbana

100. **Introduction to Horticulture.** Basic principles of plant growth and development as they apply to the production, marketing, and utilization of fruits, vegetables, and ornamental plants. Prerequisite: Credit or concurrent registration in Botany 100 or equivalent. 3 hours.
110. **Plant and Animal Genetics.** Same as Agronomy, Animal Science, and Dairy Science 110. See Agronomy 110.
122. **Greenhouse Management.** Commercial greenhouse construction and operation, including heating, cooling, soils, potting, fertilizers, and watering; lectures, readings, demonstrations, and greenhouse practice. 3 hours.
131. **Introduction to Floral Design.** Introduces the art of arranging flowers, foliages, and accessories according to the principles of design. Lecture and lab; fee required. 2 hours. Credit not given for students in ornamental horticulture.
190. **Home Vegetable Gardening.** Principles and practices of producing vegetables in the home garden by traditional and organic methods; lecture and laboratory. 3 hours. No credit for horticulture majors; all other students may receive credit for either Horticulture 190 or 242, but not for both.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Identification and Use of Woody Ornamental Plants, I.** Systematic approach to the identification, ornamental characters, culture, propagation, production, and use of woody ornamental deciduous trees and shrubs; special emphasis on the cultivated varieties. Prerequisite: Botany 100 or consent of instructor. 3 hours.
202. **Identification and Use of Woody Ornamental Plants, II.** Systematic approach to the identification, ornamental characters, culture, propagation, production and use of woody ornamental conifers, broadleaf evergreens, vines, ground covers and woody ornamental deciduous trees and shrubs; special emphasis on the cultivated varieties. Prerequisite: Botany 100 and Horticulture 201, or consent of instructor. 3 hours.
210. **Home Grounds Planning and Design.** Practice of developing home grounds; emphasis on analysis and practical solutions of typical site problems; and evaluation of plants and garden structures as elements in home grounds planning and design. Prerequisite: Horticulture 202 or consent of instructor. 4 hours. Registration limited to horticulture majors, students in the ornamental horticulture curriculum, or students in the agricultural occupations for secondary teachers curriculum only. Credit allowed toward fulfilling requirement in Group III, ornamental horticulture curriculum, only if Horticulture 211 is also completed.
211. **Home Grounds Development and Construction.** Continuation of Horticulture 210, with emphasis on development of home grounds and construction methods and techniques. Prerequisite: Horticulture 202 and 210, or consent of instructor. 3 hours. Registration limited to horticulture majors, students in the ornamental horticulture curriculum, or students in the agricultural occupations for secondary teachers curriculum only.
212. **Landscape Contracting.** Interpretation of the landscape architect's plans and specifications; estimating quantities of materials; and computing costs and procedures for bidding and executing landscape construction. Prerequisite: Horticulture 211. 3 hours. Registration limited to horticulture majors, students in the ornamental horticulture curriculum, or students in the agricultural occupations for secondary teachers curriculum only.
221. **Plant Propagation.** Principles, methods, and practices employed in the propagation of plants, emphasizing anatomical features and physiological principles involved in sexual propagation (seeds) and asexual propagation (division, cuttings, budding, grafting, etc.). Prerequisite: Botany 100 or equivalent. 3 hours.
223. **Floricultural Crops Production, I.** Commercial production of major cut-flower crops in the greenhouse and field. Prerequisite: Horticulture 122. 3 hours.

224. **Floricultural Crops Production, II.** Commercial production of pot plants and minor greenhouse and field-grown cut flowers. Prerequisite: Horticulture 223. 3 hours.
225. **Ornamental Gardening.** Theory and practice of planting and maintaining ornamental plants in public and private landscaped areas; the functional use of ornamental woody plants, flowers, and turf in the landscape. Not open to students in the ornamental horticulture curriculum. 3 hours.
226. **Bedding and Foliage Plants.** Commercial production and use of tender ornamental plants (grown for outdoor bedding purposes), and of foliage plants (suitable for indoor decorative uses). Prerequisite: Horticulture 122 or Botany 100. 3 hours.
227. **Indoor Plant Culture, Use and Identification.** Culture, use, and identification of indoor plants in relation to their application in interior situations; discusses the influence of water, fertilizer, soil type, light (natural and artificial), relative humidity, storage and shipping. Students design and maintain an interior plant area; lecture and lab. A field trip is required. Prerequisite: Botany 100 or consent of instructor. 3 hours.
230. **Garden Flowers.** The place of herbaceous flowers in the landscape and their cultural requirements and uses; the planning of perennial borders for continuous bloom; and survey of some of the genera contributing importantly to our flower gardens. Of value to nonfloriculture students interested in the home grounds. Prerequisite: Botany 100. 3 hours.
231. **Floral Decorations.** Principles of design as applied to the composition and decorative use of flowers, foliages, and accessories. Prerequisite: Junior standing. 3 hours.
232. **Advanced Floral Decorations and Flower Shop Management.** Continuation of Horticulture 231. Flower shop management; for horticulture students only. Prerequisite: Horticulture 231. 3 hours.
233. **Floriculture for the Home.** Fundamentals of home gardening and the effective use of ornamentals as a part of the home environment; subjects include the selection, culture, and use of garden annuals, biennials, perennials, bulbs, and house plants; garden tools and equipment; soil preparation; plant propagation; principles of design and planting methods; garden maintenance; use of fertilizers; pest control; training and pruning; lawn care; hybridizing; growing structures; and care of cut flowers. Not open to students in the ornamental horticulture curriculum. 3 hours.
234. **Nursery Management.** Study of the various practices and methods of operating a commercial nursery for the production of ornamental woody plants used in landscaping. Lectures, assigned reading, and laboratory exercises. Prerequisite: Botany 100. 3 hours.
236. **Turfgrass Management.** Principles and practices used in management of the turf grasses in areas of general and special use; of value to students interested in one or more aspects of turf grass utilization. Lectures, assigned readings, and laboratory exercises. Prerequisite: Botany 100. 3 hours.
242. **Vegetable Crops Production.** Introduction to the growth habits, soil and climatic requirements, culture, storage, varietal characteristics, and pests of vegetable crops. Prerequisite: Horticulture 100 or consent of instructor. 3 hours.
250. **Horticulture Internship.** A supervised off-campus learning experience of at least 300 hours in a horticulture related enterprise. Prerequisite: Junior status; good academic standing; major in ornamental horticulture, horticulture, or agricultural science with horticulture emphasis; completion of a 200- or 300- level course appropriate to the internship activities; and consent of instructor. 2 hours. May be repeated to a maximum of 4 hours.
251. **Arboriculture.** Principles in the care and maintenance of ornamental trees and shrubs in the established landscape; consideration of environmental factors, soils, nutrition, pruning, tree surgery, and insect and disease control. Prerequisite: Agronomy 101. 3 hours.

- 261. Small Fruit and Viticulture Science.** Technological application of biological principles to the culture of strawberry, grape, blueberry, raspberry, blackberry, currant, gooseberry, and miscellaneous small fruits. Prerequisite: Horticulture 100 or Botany 100. 2 hours.
- 262. Tree Fruit Science.** Technological application of biological principles to the culture of apple, peach, and other temperate tree fruit crops. Prerequisite: Horticulture 100 or Botany 100. 2 hours.
- 300. Special Problems.** Supervised research on individual problems in any phase of horticulture; includes anatomy, breeding, physiology, ecology, or general culture of fruit, vegetable, or ornamental plants. Prerequisite: Not open to students on probation; written consent of the instructor and authorized departmental approval required prior to advanced enrollment and registration. 1 to 5 hours, or 1/2 to 2 units.
- 307. International Food Crops.** Various international food crops studied; production and problems created by diseases and insects emphasized; tropical and subtropical crops stressed; temperate food crops of international importance included; and ecological factors affecting fundamentals of food crop production and plant protection examined. Prerequisite: Junior standing or consent of instructor. 3 hours or 3/4 unit. Offered in alternate years.
- 310. Diseases of Ornamental Plants.** Same as Plant Pathology 310. See Plant Pathology 310.
- 321. Floricultural Physiology.** Study of the physiology and metabolism of floricultural crops during their development from seeds through flowering. Lectures and discussion. Prerequisite: Agronomy 101, Botany 100, or consent of instructor. 4 hours or 1 unit.
- 322. Plant Nutrition.** Study of the mechanisms of and factors affecting the absorption, transport, and functions of the essential elements required by higher plants. Lectures, discussions, and laboratory. Prerequisite: Agronomy 101; Botany 234 or 330, or consent of instructor. 4 hours or 1 unit.
- 323. Principles of Plant Breeding.** Same as Agronomy 323. See Agronomy 323.
- 333. Plant Physiology Laboratory.** Same as Agronomy 333 and Botany 333. See Botany 333.
- 335. Economics of Food Distribution.** Same as Agricultural Economics 335. See Agricultural Economics 335.
- 336. Perennial Grass Ecosystems.** Same as Agronomy 336. Different levels of ecological organization in perennial grass ecosystems. Provides advanced study for students in turfgrass and forage management. Cultural programs are derived from an understanding of interrelationships between different components of the ecosystem, including man and animals. Term paper required. Field trips; see Timetable for approximate cost. Prerequisite: Horticulture 236 or Agronomy 322. 4 hours or 1 unit.
- 340. Introduction to Applied Statistics.** Same as Agricultural Engineering, Agronomy, Animal Science, Dairy Science, Food Science and Forestry 340. See Agronomy 340.
- 345. Growth and Development of Horticultural Crops.** Factors affecting growth, development, and quality of horticultural crops, such as photoperiodism, growth regulators, carbon dioxide levels, etc. Lecture and discussion. Offered in alternate years. Prerequisite: One year of general chemistry and one semester of general or plant physiology, or consent of instructor. 4 hours or 1 unit.
- 398. Postharvest Physiology of Horticultural Crops.** Physiology, biochemistry, and anatomy of fruits and vegetables during development, maturation, and ripening in situ and in storage. Prerequisite: Botany 100 and Chemistry 102 or 103, or equivalent. 4 hours or 1 unit. Offered in alternate years.
- 424. Enzymes and Metabolic Pathways of Plants.** Same as Agronomy and Botany 424. See Agronomy 424.
- 431. Plant Cell Metabolism.** Same as Agronomy, Biology, Forestry, and Plant Pathology 431. See Biology 431.

432. **Plant Cell Energetics.** Same as Agronomy, Biology, Forestry, and Plant Pathology 432. See Biology 432.
433. **Environmental Regulation of Plant Growth.** Same as Agronomy, Biology, Forestry, and Plant Pathology 433. See Biology 433.
434. **Regulation of Plant Development and Reproduction.** Same as Agronomy, Biology, Forestry, and Plant Pathology 434. See Biology 434.
447. **Horticulture Seminar.** Discussion of current research and literature pertaining to problems of horticulture and related fields. Prerequisite: Graduate standing in horticulture or related fields. 1/4 unit.
488. **Plant Pigments.** Same as Botany 488. A comprehensive presentation of the nature, function, distribution, biosynthesis, degradation, separation, and spectroscopic properties of pyrrole, carotenoid, quinone, and anthocyanin pigments. Prerequisite: Botany 330 or consent of instructor. 1 unit. Offered in alternate years.
490. **Research Methods in Horticulture.** Lectures, discussions, demonstrations, and laboratory exercises dealing with methods and apparatus used in horticultural research. Prerequisite: One year of general chemistry and one semester of general or plant physiology, or consent of instructor. 1 unit.
492. **Special Topics in Horticulture.** Readings and discussion in selected phases of horticulture including such topics as genetics, physiology, anatomy, morphology, and ecology of horticultural crops. 1/2 to 2 units.
494. **Professional Orientation in Horticulture.** The philosophy and components of graduate education, with development of the principles useful in teaching, research, and extension in horticulture. Prerequisite: Graduate standing in horticulture. 1/4 unit.
499. **Thesis Research.** 0 to 4 units

HUMAN DEVELOPMENT AND FAMILY ECOLOGY

Head of Department: Professor Rand D. Conger

Department Office: 206 Child Development Laboratory, 1105 West Nevada, Urbana

105. **Introduction to Human Development.** Systematic overview of the biological, psychological, familial, and cultural factors related to human growth and development throughout the life cycle. 3 hours.
106. **Observation and Assessment of Development.** Developmental criteria applied to observation data; inclusion of natural and laboratory settings to give students skill in recording and interpreting human behavior with emphasis on the child. Prerequisite: Credit or concurrent registration in Human Development and Family Ecology 105. 3 hours.
143. **Biological Bases of Human Behavior.** Same as Anthropology, Ecology, Ethology, and Evolution and Psychology 143. See Anthropology 143.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
202. **Child Development Methods and Experience.** Studies methods of working with and planning for the development of young children in their families and other settings; includes an overview of the history and philosophy of early childhood programs and direct experience with young children in a laboratory preschool. Prerequisite: Human Development and Family Ecology 105, or consent of instructor. 4 hours.
203. **Child Development: Period of Infancy and Early Childhood.** Study of the growth and development of young children; their biological and psychological needs and the environmental influences affecting their development and relationships with others; gives an understanding of the developmental sequences and the basic principles of child care and training. Prerequisite: Human Development and Family Ecology 105 or Psychology 216. 4 hours.

- 204. Motor Development in Childhood.** Same as Physical Education 262. See Physical Education 262.
- 210. Comparative Family Organization.** Same as Anthropology 210. Survey of trends in family structure, functions, roles, and values; evaluation of anthropological, psychological, and sociological findings relevant to family life; and examination of selected family adjustment problems. 3 hours.
- 220. Organization and Administration of Child Development Programs.** Examines principles and practices of organization and administration of programs and community services for young children and their families with special focus on leadership; emphasizes daily planning and operation of programs and services, and internal and external factors influencing program management and effectiveness. Prerequisite: Human Development and Family Ecology 202, or consent of instructor. 3 hours.
- 291. Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
- 292. Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
- 301. Issues in Socialization and Development.** Presents and uses theories of socialization to evaluate and analyze current issues and socialization practices; delineates historical and philosophical trends in socialization, and discusses the implications of these trends for generating social policy affecting the developing individual. Prerequisite: Human Development and Family Ecology 202 and 203; or equivalent. 3 hours, or 3/4 or 1 unit.
- 304. Gerontology.** An interdisciplinary approach to the study of aging and the aged from the developmental, behavioral, and social points of view. Prerequisite: Senior standing. 3 hours or 1 unit.
- 305. Pediatrics and Nutrition.** Same as Foods and Nutrition 305 and Elementary and Early Childhood Education 301. See Foods and Nutrition 305.
- 310. Contemporary American Family.** Examination of the variety of forms families assume in the United States as responses to different environments. Families are compared in the areas of kinship, family organization, patterns of interpersonal relationships, socialization, values, and integration with the larger society. Prerequisite: Human Development and Family Ecology 210 or consent of instructor; and 6 hours of social science. 3 hours, or 3/4 or 1 unit.
- 319. Day Care Practicum.** Same Psychology 319. See Psychology 319.
- 349. Music in Early Childhood.** Same as Music 349. See Music 349.
- 354. Growth and Physical Development of Children.** Same as Physical Education 354. See Physical Education 354.
- 388. Special Topics in Human Development and Family Ecology.** Prerequisite: Senior standing and consent of instructor. 3 hours or 3/4 or 1 unit. May be repeated to a maximum of 6 hours, or 2 units.
- 390. Human Development: Theory and Methodology.** Discussion and evaluation of theories of human development and critical examination of current research; examples from current literature illustrating research methods and the differing theoretical orientations shaping research directions in human development. 4 hours or 1 unit.
- 410. Family Interaction.** Family relationships and their significance to the growth of family members. Prerequisite: Human Development and Family Ecology 210. 1 unit.
- 418. Seminar in Human Development.** Discusses an overview of theories and research in human development; focuses on major issues regarding development, differing conceptualizations of those issues, and relevant research. Prerequisite: Consent of instructor. 1 unit.
- 419. Seminar in Family Relationships.** Critical evaluation of research literature in the field of marriage and family relationships. Prerequisite: Human Development and Family Ecology 410. 1 unit.

- 457. Sensorimotor Development.** Same as Physical Education 457. See Physical Education 457.
- 493. Advanced Studies in Human Development and Family Ecology.** Library or experimental research on specific problems of limited scope. May be taken in addition to 8 units required for a master's degree by students who do not write a thesis. For non-thesis students only. 1/2 or 1 unit.
- 499. Thesis Research.** 0 to 4 units

HUMAN RESOURCES AND FAMILY STUDIES, SCHOOL OF

(Please refer to individual alphabetical listings: Family and Consumer Economics, Foods and Nutrition, Human Development and Family Ecology, Human Resources and Family Studies, and Textiles and Interior Design.)

Director of School: Professor M. M. Dunsing

School Office: 260 Bevier Hall, 905 S. Goodwin, Urbana

HUMAN RESOURCES AND FAMILY STUDIES

Director of School: Professor M. M. Dunsing

School Office: 260 Bevier Hall, 905 S. Goodwin, Urbana

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 268. Cooperative Extension.** Same as Agriculture 268. See Agriculture 268.
- 269. Cooperative Extension: Summer Experience.** Same as Agriculture 269. See Agriculture 269.
- 369. Educational Programs in Cooperative Extension.** Same as Agriculture 369. See Agriculture 369

HUMANITIES, SCHOOL OF

(Please refer to individual alphabetical listings: Classics, Comparative Literature, English, French, Germanic Languages and Literatures, History, Humanities, Linguistics, Philosophy, Religious Studies, Slavic Languages and Literatures, Spanish, Italian, and Portuguese, and Speech Communication.)

Director of School: Professor N. Baym

School Office: 112 English Building, 608 S. Wright, Urbana

HUMANITIES

Director of School: Professor N. Baym

School Office: 112 English Building, 608 S. Wright, Urbana

- 131. Introduction to Renaissance Civilization.** A study of major historical, intellectual, and artistic achievements of the period; organized around a series of topics, each focusing on a society, movement, or historical event as reflected in literature, art, and the history of ideas. 3 hours.
- 141. Introduction to American Civilization, I.** An introduction to the multidisciplinary study of major aspects, events, and periods of the American experience; includes a

series of topics, each focusing on one society, movement, or historical event as reflected in literature, art, history, and politics. 3 hours.

142. **Introduction to American Civilization, II.** Continuation of Humanities 141. 3 hours.
171. **American Women in Change: An Introduction.** Interdisciplinary introduction to women's studies in literature, history, and speech communication; includes women's actual roles in American history (seventeenth to early twentieth centuries) and literature and sex-related issues in language; and emphasizes interconnections among the three fields. 3 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
261. **Survey of World Cinema, I: The Beginnings through the Coming of Sound.** Survey of the development of equipment, techniques, and themes of the cinema from its origins through the coming of sound; lectures, discussions, and showings of selected films. 3 hours.
262. **Survey of World Cinema, II: The Thirties to the Present.** Survey of the development of equipment, techniques, and themes of the cinema from the coming of sound to the present; lectures, discussions, and showings of selected films. 3 hours.
279. **Introduction to Foreign Language Education.** Same as French, German, Latin, Russian, and Spanish 279. Introduction to the theory and methodology of second language teaching, including the history of foreign language education, contemporary practices and perspectives, and current research in second language acquisition. Prerequisite: Sophomore standing and enrollment in a teacher education curriculum, or consent of instructor. 3 hours.
290. **Individual Study.** Supervised reading and research on interdisciplinary humanities topics chosen by the student in consultation with a faculty member. Prerequisite: Consent of humanities advisor (an approved Learning Agreement must be submitted to the School of Humanities office not later than the second week of the semester or the first week of the summer session). 2 to 4 hours. May be repeated to a maximum of 8 hours.
292. **Senior Thesis.** Individual research for concentrators in humanities leading to the completion of a thesis. Prerequisite: Senior standing, a declared option in humanities field of concentration, and consent of advisor. 2 to 4 hours. May be repeated to a maximum of 8 hours.
295. **Special Topics: Interdisciplinary.** Interdisciplinary topics in the humanities; topics vary, but are normally related to one of the options in the humanities field of concentration. 3 hours. May be repeated as topics vary; students may register for two different topics in the same semester.
297. **Special Topics: Junior Seminar and Tutorial.** Interdisciplinary seminar and tutorial in selected topics related to one of the options in the humanities field of concentration. Prerequisite: Junior standing and consent of humanities advisor (tutorial students must submit an approved Learning Agreement to the School of Humanities office not later than the second week of the semester or the first week of the summer session). 3 hours. May be repeated to a maximum of 6 hours.
298. **Special Topics: Senior Seminar and Tutorial.** Interdisciplinary seminar and tutorial in selected topics related to one of the options in the humanities field of concentration. Prerequisite: Senior standing and consent of humanities advisor (tutorial students must submit an approved Learning Agreement to the School of Humanities office not later than the second week of the semester or the first week of the summer session). 3 hours. May be repeated to a maximum of 6 hours.
361. **Film Theory and Criticism.** Study of major aesthetic and critical theories about film; study of theory and practice of film criticism. Prerequisite: One cinema studies course at the 200 or 300 level and one college course in literature, or consent of instructor. 3 hours or 1 unit.

- 382. Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as a Second Language, French, German, Slavic, and Spanish 382, and Linguistics 386. Theory and practice of computer-assisted instruction, with special emphasis on problems and techniques of foreign-language instruction. General principles; survey of existent and probable future CAI systems; and practical experience with lesson design and programming on the PLATO system. Linguistics majors are advised to complete Linguistics 306 before registering for this course. Prerequisite: Two years college language or equivalent, and consent of instructor. 4 hours or 1 unit.
- 395. Special Advanced Topics: Interdisciplinary.** Offers interdisciplinary topics in the humanities; topics vary, but normally relate to the interdisciplinary areas of study within the humanities concentration or to the special humanities facilities (e.g., the Language Learning Laboratory). Prerequisite: Prerequisites will vary according to topic. See Timetable. 3 hours or 1 unit. May be repeated as topic varies to a maximum of 6 hours or 2 units

INDUSTRIAL DESIGN

(See Art and Design)

INDUSTRIAL ENGINEERING

(See Mechanical and Industrial Engineering)

INTERIOR DESIGN

(See Textiles and Interior Design)

ITALIAN

(See Spanish, Italian, and Portuguese)

JAPANESE

(See Asian Studies)

JOURNALISM

Head of Department: Professor T. B. Littlewood

Department Office: 120A Gregory Hall, 810 S. Wright, Urbana

- 114. Agricultural Communications Media and Methods.** Same as Agricultural Communications 114. See Agricultural Communications 114.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 204. Typography.** Study of type lore and design; type dimensions; printer's arithmetic and copyfitting; platemaking; printing processes; shop organization; and terminology.

- Prerequisite: Registration in the College of Communications or consent of the college. 3 hours. News-editorial majors do not receive credit for this course.
214. **Agricultural Communications Strategy.** Same as Agricultural Communications 214. See Agricultural Communications 214.
217. **History of Communications.** Same as Communications 217. Nature and development of communication systems; history of communication media; history of journalism, advertising, and broadcasting; and communications in the modern world. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.
218. **Communications and Public Opinion.** Same as Communications 218. Theory of public opinion and of communications; relation of communication systems to public opinion, social systems, and the political order. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.
220. **Processes and Systems of Communications.** Same as Communications 220. Analysis of various psychological and sociological approaches to communication; examination of the relationship between interpersonal and mass communication; and analysis of the structure and development of systems of mass communications. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.
223. **Photojournalism.** A basic photography course designed to give students a proficiency in picture taking and processing and to acquaint them with picture editing and other illustrative problems. For current fees, see Timetable; cameras provided by the college. Prerequisite: Registration in the College of Communications or consent of instructor. 3 hours. News-editorial majors do not receive credit for this course.
231. **Mass Communication in a Democratic Society.** Same as Communications 231. Study of the philosophical bases of the functions and the responsibilities of mass communications. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.
241. **Law and Communications.** Same as Communications 241. Historical background of the nature and meaning of the law as it relates to journalism and contemporary problems of freedom of expression. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.
251. **Social Aspects of Mass Communications.** Same as Communications 251 and Sociology 251. Media structures related to cultural content and functions; problems of life and society as treated in mass-produced communications. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.
252. **Television News Production.** Same as Radio and Television 252. Principles of television studio and remote videotape operations; assembling visual components of television news stories and using graphics. Prerequisite: Consent of department. 3 hours.
267. **Radio News Production.** Same as Radio and Television 267. Principles of radio studio operations; production of remote broadcasts; and production and editing of radio news stories and features. Prerequisite; Consent of department. 3 hours.
291. **Special Problems.** Special projects, research, and independent reading in journalism for students capable of individual work under the guidance of a faculty adviser. Prerequisite: Consent of head of department. 1 to 3 hours.
326. **Magazine Article Writing.** Preparation of feature stories and articles; techniques of marketing, market analysis, and publishing articles written in the course. Prerequisite: Journalism 350; registration in the College of Communications or consent of the college. 3 hours or 1/2 unit.
330. **Magazine Editing.** Basic principles of editing for consumer, business, trade, and company magazines; communications theory, market analysis, editorial process, design process, production process, and distribution process as they relate to magazine publishing. Prerequisite: Credit or concurrent registration in Journalism 326 or consent of instructor. 3 hours or 1/2 unit.

340. **News Publication Management.** An introduction to the administration and management of print media news organizations. Prerequisite: Journalism 350 or Advertising 391; and consent of the department. 3 hours or 1/2 unit.
350. **Reporting, I.** Fundamentals of journalistic writing; reporting news of public affairs. Prerequisite: Enrollment as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
360. **Graphic Arts.** Rational and aesthetic standards of visual communications; principles and techniques of making visual statements; and uses of visual technology in wedding verbal and nonverbal languages. For current fees, see Timetable. Prerequisite: Enrollment as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
370. **News Editing.** Newspaper editing and headline writing; the makeup and design of newspaper pages. Prerequisite: Journalism 350 and 360; enrollment as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
372. **Broadcast News Writing and Gathering.** Gathering, writing, and editing news for radio and television; critical analysis of broadcast news practices, past and present; ethics of broadcast journalism; audio and visual communication principles as applied to news dissemination; editing and writing to film, tape and graphics. Individual and team projects. Prerequisite: Journalism 350 and Radio and Television/Journalism 252 or 267. 4 hours or 1 unit.
380. **Reporting, II.** The interviewing, analytical, and writing techniques of reporting complex news stories with clarity and depth. Prerequisite: Journalism 350 and 360; enrollment as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
382. **Broadcast News Editing.** Principles of editing audio tape, video tape, and scripts with audio-visual materials; editing story units for broadcast; assembling news and public affairs programs; broadcast news editing ethics, research, and criticism. Prerequisite: Journalism 372. 4 hours or 1 unit.
390. **Advanced Reporting.** Advanced reporting projects in specialized fields; recommended for news-editorial seniors. Prerequisite: Journalism 350 and 380. 3 hours or 1 unit.
392. **Broadcast Journalism Practicum.** Individual and team produced advanced enterprise projects in specialized fields. Subject matter to be coordinated with Journalism 390. Prerequisite: Journalism 382. 2 hours or 1/2 unit.
400. **Issues in Journalism.** Seminar on issues of contemporary importance in journalism. Prerequisite: Consent of department. 1/2 unit.
468. **The Political Economy of Communications.** Same as Communications 468. Analysis of the structure, policy, and behavior of such media of communication as newspapers, magazines, books, postal service, telegraph, telephone, broadcasting, and film; special emphasis on their relationships to political order and the economy. Prerequisite: Consent of College of Communications. 1 unit.
470. **Communications and Popular Culture.** Same as Communications 470. Problems of cultural analysis related to the media of communications; social implications of communications research. Prerequisite: Consent of College of Communications. 1 unit.
471. **Proseminar in Communications, I.** Same as Communications 471. General discussion of the mass media of communications, their role as social institutions, and their control and support; content, audience, and effect of the mass media. Prerequisite: Consent of College of Communications. 1 unit.
472. **Proseminar in Communications, II.** Same as Communications 472. General discussion of the problem of communications, including the individual as a communicating system, symbolic processes, analysis of messages, psycholinguistics, and language as social behavior. Prerequisite: Consent of College of Communications. 1 unit.
473. **History and Theory of Freedom of the Press.** Same as Communications 473. Development of the Anglo-American press system and the idea of freedom of the

press; contemporary mass media and their implications for freedom and democracy. Prerequisite: Consent of College of Communications. 1 unit.

- 474. **Communications Systems.** Same as Communications 474. Analysis of the structure and development of communications systems; examination of the role of communication in social change, political movements, and formal organizations. Prerequisite: Consent of College of Communications. 1 unit.
- 490. **Special Topics in Journalism.** Prerequisite: Consent of head of department. 1/2 or 1 unit.
- 492. **Research Methods in Communications.** Same as Communications 492. See Communications 492.
- 499. **Thesis Research.** Prerequisite: Graduate standing in journalism. 1 to 2 units

KOREAN

(See Asian Studies)

LABOR AND INDUSTRIAL RELATIONS

Director of Institute: Professor W. Franke

Institute Office: 247 Labor and Industrial Relations Building, 504 E. Armory, Champaign

- 199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 315. **The Economics of Poverty and Income Maintenance.** Same as Economics 315. See Economics 315.
- 318. **Work in Industrial Society.** Same as Sociology 318. See Sociology 318.
- 341. **Economics of Labor Markets.** Same as Economics 341. See Economics 341.
- 345. **Economics of Human Resources.** Same as Economics 345. See Economics 345.
- 347. **Labor Law, I.** Same as Law 347. See Law 347.
- 355. **Industrial Social Psychology.** Same as Psychology 355. See Psychology 355.
- 357. **Psychology of Industrial Relations.** Same as Psychology 357. See Psychology 357.
- 360. **Employee Benefit Plans.** Same as Finance 360. See Finance 360.
- 409. **Organizational Behavior.** Same as Business Administration 409. See Business Administration 409.
- 418. **Seminar in Industrial and Economic Sociology.** Same as Sociology 418. Discussion and individual research on such topics as industrialization, labor-management relations as group relations, the interrelations of industry and community, technology and the structure of controls in industry, and the problem of a social economics. Prerequisite: Labor and Industrial Relations 318 or consent of instructor. 1 unit.
- 420. **Formation of Public Policy.** Same as Political Science 420. See Political Science 420.
- 422. **Government Regulation.** Focuses on government policies affecting collective bargaining and personnel practices; includes an introduction to theories of political science and public policy for an understanding of government regulation in the employment area. Prerequisite: Labor and Industrial Relations 347 or 491, or consent of instructor. 1 unit.
- 430. **Foundations of Industrial-Organizational Psychology.** Same as Psychology 430. See Psychology 430.
- 435. **Motivation and Morale in Industry.** Same as Psychology 435. See Psychology 435.
- 440. **Labor Economics.** Same as Economics 440. See Economics 440.
- 441. **Labor Economics.** Same as Economics 441. See Economics 441.

- 442. Collective Bargaining.** Same as Economics 442. Development of a theory of the continuing interactions between union and management which define and modify the role of each and the terms of employment; use of appropriate social science concepts; and emphasis on the negotiating process, the structure of bargaining, and such issues as wages, worker security, and management authority, and on the interactions between the parties and the governmental process. Prerequisite: Consent of instructor. 1 unit. Graduate credit is not given for both Economics 343 and Labor and Industrial Relations 442.
- 443. Problems and Practices of Labor Dispute Settlement.** Same as Economics 443 and Law 343. Seminar in the policies and practices of labor contract administration; comparative study of the fundamentals of grievance handling; analysis of mediation and fact-finding techniques; and special emphasis on the use of arbitration as a means of reducing industrial conflict. Prerequisite: Consent of instructor. 3 hours or 1 unit. Hourly credit only applicable to LAW 343.
- 444. Problems and Policies in Human Resources.** Same as Economics 444. See Economics 444.
- 445. Investment in Human Resources.** Same as Vocational and Technical Education 445. Activities which influence future monetary and psychic income by improving the resources in people; coverage of investments, including schooling, on-the-job and other training, migration, and the search for information on jobs and incomes; emphasis on human capital concepts, public human resources policy, and problems of special groups. Prerequisite: An introductory course in economics and in quantitative methods, as specified by the department. 1 unit.
- 447. Labor Union Organization and Administration.** Same as Economics 447. Analysis of the structure, functions, and government of the modern American trade union movement; survey of the environmental factors, objectives, and action programs with considerable emphasis on economic and internal institutional factors, including the roles of leaders, policy determination and execution, jurisdictional disputes, and governmental regulations; and examination of various labor union theories in America. Prerequisite: Major in social science or consent of instructor. 1 unit.
- 448. Problems of Personnel Management.** Same as Business Administration 411. See Business Administration 411.
- 451. Labor Law and Public Policy.** Same as Law 376. Analysis of current major policy issues in labor law and administration through the concepts and techniques of the lawyer and the labor relations specialist. Prerequisite: For law students, Law 347 or consent of instructor; for Institute of Labor and Industrial Relations and other graduate students, one semester of labor and industrial relations course work or consent of instructor. 3 hours or 1 unit. Hourly credit only applicable to LAW 376.
- 454. Foreign and International Labor Movements.** Examines the history and organization, and economic and political policies of major labor movements in industrialized countries as well as their international organizations; comparatively analyzes particular problems confronting these movements. Prerequisite: Consent of instructor. 1 unit.
- 455. Labor in Less Developed Countries.** The role and place of LDCs in the world; colonialism, independence, and nation-building; economics, power, and stratification; development of labor markets and labor movements; economic, political, and social consequences of international trade, finance, and investment; international diffusion of technology and ideology; nation-states, multi-national corporations and world community; and UN, ILO, UNCTAD, UNIDO and other international and regional organizations and their impact on labor in LDCs. Prerequisite: Economics 101 or 109, or equivalent. 1 unit.
- 456. Industrial Relations Theory, I.** An integrated analysis of the principles of labor relations through the study of the works of the major theorists and their critics. Prerequisite: Consent of instructor. 1 unit.
- 457. Industrial Relations Theory, II.** Continuation of Labor and Industrial Relations 456. Prerequisite: Labor and Industrial Relations 456. 1 unit.

- 458. Faculty-Student Workshop.** Training and experience for Ph.D. students in the application of social science and industrial relations theory and research methodology to contemporary industrial relations problems through presentation and discussion of faculty and student research. Ph.D. students are required to give at least one paper, lecture, or other acceptable workshop presentation and to participate in workshop discussions during the entire period of their campus residency for a total of 1 unit of credit. Prerequisite: Labor and Industrial Relations 456 and 457. 0 to 1 unit.
- 490. Individual Topics.** A student in labor and industrial relations may register for this unit with the consent of the curriculum adviser and the adviser under whom the student will perform individual study or research. Such individual work may include special study in a subject matter for which no course is available or an individual research project, including on-the-job research in industry, which is not being undertaken for a thesis. 0 to 2 units.
- 491. Industrial Relations Systems.** A general framework for the analysis of labor-management relations; topics include the theory of industrial relations systems, the American system of industrial relations, intercountry system differences, and the application of systems theory to selected labor-management problem areas, such as income policies, multi-national organizations, and industrial democracy. Prerequisite: Graduate standing. 1 unit.
- 492. Research Seminar in Labor and Industrial Relations.** Systematic analysis of theories and procedures of the various social and physical sciences bearing on research in labor and industrial relations; primary emphasis on the process of integrating the approaches and techniques of the various social sciences with respect to the study of problems in labor and industrial relations as met in practice in management, the union, and government service, as well as in teaching and research in the field. Prerequisite: Major in social sciences or consent of instructor. 1 unit.
- 493. Quantitative Methods in Labor and Industrial Relations.** Introduction to statistical concepts and methods in the social sciences and their application to industrial relations problems; familiarizes the student with modern methods of probability sampling, statistical inference, and multivariate analysis, and their application to current research problems in labor and industrial relations. Prerequisite: Any elementary statistics course. 1 unit.
- 494. Tutorial Seminar.** Training and experience for Master's students in carrying out a problem solving project from formulation to written report in a chosen area of labor and industrial relations. Each student selects an individual topic with the approval and guidance of a faculty member. The tutorial is required of all master's candidates who do not write a thesis. Prerequisite: Completion of no fewer than 6 units of Labor and Industrial Relations course work. 1 unit.
- 496. The Evolution of Labor-Management Relations in America.** Historical analysis and interpretation of the development of the labor movement and labor-management relations at the plant, industry, and national levels. Prerequisite: Graduate standing in labor and industrial relations or consent of instructor. 1 unit.
- 497. Collective Bargaining in Public Employment.** Same as Social Work 497, Administration, Higher, and Continuing Education 497, and Political Science 469. Development of employee organization, collective bargaining, and public policies in the public sector: federal, state, and local; analysis of contemporary bargaining relations, procedures, problems, and consequences. Prerequisite: Consent of instructor. 1 unit.
- 498. Analysis of Organizations in Industrial Relations.** Intensive analysis of organizational behavior, with the main focus upon the theory of organizations as social institutions; concepts drawn from the various social sciences and applied to the principal organizations concerned with industrial relations; and examination of the internal dynamics of unions, managements, and government agencies, with special reference to decision-making processes, and their individual relations to the interactions among them. Prerequisite: Consent of instructor. 1 unit.
- 499. Thesis Seminar.** For all students writing theses in labor and industrial relations at the M.A. and Ph.D. levels. 0 to 4 units

LANDSCAPE ARCHITECTURE

Head of Department: Professor R. B. Riley

Department Office: 214 Mumford Hall, 1301 W. Gregory, Urbana

The curriculum in the Department of Landscape Architecture is under revision. Please consult the Timetable for latest information on courses currently being offered.

101. **Introduction to Landscape Architecture.** A survey of the practice, profession, and philosophy of landscape architecture. 2 hours.
133. **Landscape Design.** Introduction to the fundamentals of design, including studies in two- and three-dimensional abstract and applied problems, basic elements and procedures of landscape design, and principles of landscape composition. Prerequisite: Credit or concurrent registration in Landscape Architecture 180, or consent of instructor. 5 hours.
134. **Site Design.** Principles and practices of site planning; orientation, circulation, and land use definitions and relationships applied to site scale problems; and application of site design process. Field trip required; see Timetable for current fees. Prerequisite: Landscape Architecture 133 or consent of instructor. 5 hours.
142. **Landform Design and Construction.** Introduction to the fundamentals of the earth's surface as a design element; limitations and uses of landforms; and methods of grading, surface drainage, and land surveying. 3 hours.
150. **Landscape Surveys.** Principles and practices of identifying, analyzing, and recording landscape resources. Field trip required; see Timetable for current fees. Prerequisite: Geography 103 or consent of instructor. 3 hours.
180. **General Drafting and Graphics.** Basic techniques and standards of drafting; lettering, views and projections, dimensioning, and shades and shadows. Prerequisite: Open to landscape architecture majors only. 2 hours.
181. **Visual Communications, I.** Principles of basic design and techniques in landscape architectural rendering. Prerequisite: Landscape Architecture 180 or consent of instructor. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Senior Honors Course.** Independent guided study and research in a selected area of landscape architecture; for candidates for honors in landscape architecture. Prerequisite: Senior standing in landscape architecture, a university grade-point average of 4.0, and consent of head of department. 1 to 6 hours. May be repeated to a maximum of 9 hours.
213. **People, Land, and Environment.** Nontechnical study of the landscape and the environment as products of a natural base worked upon by people, their technologies, and their beliefs; approach is both historical (from prehistory to science fiction) and problem-oriented (the use of land, resources, and energy). 2 or 3 hours.
214. **History of Landscape Architecture.** Analysis of the development of landscape architecture as a result of environmental and cultural influences. 3 hours.
226. **Principles of Park Design.** Introduction to the theory of master planning and site design as related to recreation area development, administration, and operations. 2 hours.
235. **Recreation and Community Design.** Development of design solutions at site and master plan scale relative to community and recreational problems; emphasizes development of analysis and design techniques. Field trip required; see Timetable for current fees. Prerequisite: Landscape Architecture 134 or consent of instructor. 5 hours.
236. **Design Workshops, I.** Project design at various scales utilizing problems of a wide range of complexity and subject matter; concerns rural, community, and urban problems, housing, recreation, and open space; and emphasizes problem analysis and generation of innovative design alternatives. Students select from several sections depending on specific interests. Prerequisite: Landscape Architecture 235 or consent of instructor. 5 hours.

243. **Site Engineering.** Principles of design and layout of drainage, circulation, and utility systems. Prerequisite: Landscape Architecture 142 or consent of instructor. 4 hours.
244. **Landscape Construction.** Construction methods, materials, and procedures related to the design of landscape structures; development of design details and cost estimating. Prerequisite: Landscape Architecture 243 or consent of instructor. 4 hours.
246. **Professional Practice.** The landscape architect as a professional practitioner; includes orientation to the concept of professionalism, forms of professional activity, and the skills needed to manage a practice. 1 hour.
251. **Plant Materials and Design, I.** Ecological principles, study of plant communities, identification of native flora and perennials, and uses of plants in the landscape; introduction to planting design. Field trips required. Prerequisite: Landscape Architecture 150, Botany 100 or 101, and Geography 103. 4 hours.
252. **Plant Materials and Design, II.** Biogeography; identification of native species, evergreens, and exotics; uses of plants in the landscape; and planting design projects. Field trips required. Prerequisite: Landscape Architecture 251. 4 hours.
253. **Planting Design.** Planting design philosophies; detailed and comprehensive design projects; management practices; technical documents; and plant identification. Field trips required. Prerequisite: Landscape Architecture 252. 4 hours.
282. **Visual Communications, II.** Continuation of Landscape Architecture 181, with emphasis on advanced rendering techniques; further exploration of the media and method of visual communication. Prerequisite: Landscape Architecture 181 or consent of instructor. 3 hours.
290. **Special Problems.** Supervised independent study, research, or special project in a selected area related to landscape architecture. Prerequisite: Junior or senior standing; consent of instructor and head of department prior to advance enrollment and registration. 1 to 6 hours. May be repeated to a maximum of 9 hours.
299. **Off-Campus Study.** Provides campus credit for off-campus study. Prerequisite: Junior standing; prior review and approval of the student's written proposal by a faculty committee and the department head. 0 to 15 hours (summer session, 0 to 6 hours). Final determination of appropriate credit is made by a faculty review committee upon completion of the student's work. Maximum credit, 15 hours (summer session, 6 hours), all of which must be earned within one semester.
337. **Regional Landscape Design.** Introduction to the process of physical planning, emphasizing land use policy and plan formulation; a regional case study is undertaken to develop analytical skills, to introduce the relationship between cultural and natural processes, and to explore the need for responsible political action. Prerequisite: Landscape Architecture 236 or consent of instructor. 5 hours or 1 1/2 unit.
338. **Design Workshops, II.** Project design at various scales utilizing problems of a wide range of complexity and subject matter; concerns rural, community, and urban problems, housing, recreation, and open space; and emphasizes problem analysis and generation of innovative design alternatives. The student selects from several sections depending on specific interests. Prerequisite: Landscape Architecture 235 or consent of instructor. 5 hours, or 1 to 1 1/2 unit.
350. **Land Use Ecology.** Ecological implications of alternative land use patterns; equipment, field techniques, and nomenclature in current use by environmental consultants; and elements of a baseline ecosystem study. Prerequisite: Consent of instructor. 3 or 4 hours, or 3/4 or 1 unit. To receive 4 hours or 1 unit, the student must complete a complex term project applying principles presented in lectures and discussions.
370. **Design-Behavior Interaction.** Critical discussion of notions and theories pertaining to the reciprocal effects of landscape architectural design and human behavior. 3 hours or 3/4 unit.
417. **Land and Society: History, Theories, and Problems.** Historical and cross-cultural investigation of the use, shaping, and perception of the land-based environment; case

studies, critical problems and issues, and theories of social- environmental interaction. Prerequisite: Consent of instructor. 1 unit.

437. **Regional Landscape Design.** Detailed investigation of landscape resources and characteristics of large geographical areas; determination of land-use design proposals. Prerequisite: Landscape Architecture 350 and 441, or consent of instructor. 1 unit.
441. **Suburban Land Use Patterns.** Same as Urban Planning 441. Theoretical basis for land use plan design, including site qualities, offsite environmental impacts, relative location of activities, and sequences of development. 3/4 unit.
442. **Spatial Design Methods.** Same as Urban Planning 442. Representations and solution procedures for problems involving the arrangement of land use activities in space; optimizing, approximate, and graphic methods, their applications, effectiveness, and efficiency; and experiments with computerized procedures. Prerequisite: Landscape Architecture 441 or consent of instructor. 1 unit.
450. **Environmental Impact Statements.** Requirements of the National Environmental Policy Act and Guidelines from the Council on Environmental Quality for preparing and writing environmental impact statements; includes interdisciplinary team efforts and impact assessment techniques. Prerequisite: Graduate or law school standing, or consent of instructor. 1 unit.
463. **Methods of Social and Behavioral Research in Designed Environments.** Same as Architecture 463. See Architecture 463.
464. **Conducting Social and Behavioral Research in Designed Environments.** Same as Architecture 464. Each student prepares and conducts research to obtain information about specific relationships between people and the designed environment. Prerequisite: Landscape Architecture 370 or Architecture 323, and Architecture 463, or equivalent; and a course in introductory statistics. 1 unit.
465. **Design/Behavior Studio.** Same as Architecture 465. Development of various environmental design projects with emphasis on the consideration of behavioral factors. Prerequisite: Landscape Architecture 370 and 464, or equivalent; and consent of instructor. 1 unit.
481. **Urban Design Studio, I.** Same as Architecture 481. See Architecture 481.
482. **Urban Design Studio, II.** Same as Architecture 482. See Architecture 482.
487. **Seminar.** Preparation, presentation, and discussion of research papers on current and future areas of landscape architectural application. Prerequisite: Consent of instructor. 1/2 unit.
490. **Special Problems.** Nature and scope of projects to be determined by consultation between student and faculty adviser; open to landscape architecture majors as well as those from other disciplines who wish to engage in interdisciplinary work. Prerequisite: Consent of instructor. 1/2 to 2 units.
498. **Master's Project.** Major independent or small-group project synthesizing knowledge from previous coursework. Prerequisite: Consent of instructor and program adviser. 1 to 2 units.
499. **Thesis Research.** Prerequisite: Graduate standing in landscape architecture. 0 to 2 units

LATIN

(See Classics)

LATIN AMERICAN AND CARIBBEAN STUDIES

Director of Center: Professor P. W. Drake

Center Office: Room 250, 1208 West California Avenue, Urbana

- 195. Freshman Seminar.** An intensive review of domestic and foreign factors influencing violence and social change in Latin America. Each semester a particular topic is selected. Prerequisite: Freshman James Scholar or other designation as a superior student. 3 hours.
- 295. Special Topics.** A topical survey of social, economic, and political factors in Latin American life. Each semester a particular topic is considered. Prerequisite: A basic course in a social science discipline. 2 to 4 hours.
- 345. Tutorials in Native Latin American Languages.** Upon the consent of the Director of the Center for Latin American Studies, tutorials are available in special native Latin American languages not regularly offered by the University. Tutorials at the elementary, intermediate, and advanced levels may be arranged. Students registering for unit credit for the first two semesters must first present satisfactory evidence of knowledge of the language at the elementary level, either in the form of credit earned at another institution or by passing a proficiency examination. Graduate credit is given only for work beyond the elementary level. Prerequisite: Consent of instructor. 2 to 4 hours, or 1/2 to 1 unit. May be repeated up to six semesters successively to a maximum of 16 hours or 4 units

LAW

Dean of College: Professor P. H. Hay

College Office: 209 Law Building, 502 E. Peabody, Champaign

- 301. Contracts-Sales, I.** What promises are enforceable including unjust enrichment and reliance, offer and acceptance, mistake, unfairness and overreaching, unconscionability, Statute of Frauds, interpretation of contract language, conditions, and third party beneficiaries. 4 hours or 1 unit (summer session, 2 1/2 hours or 1 unit).
- 302. Contracts-Sales, II.** Introduction to the Uniform Commercial Code, its interpretation and application; performance of contracts, including warranty obligations, breach, remedies for breach, impossibility and frustration of purpose, assignment and delegation, and third party rights in sold goods. 3 hours or 1 unit (summer session, 2 1/2 hours or 1 unit).
- 303. Torts, I.** A basic course in civil wrongs, including intentional torts (such as assault and battery), negligence, and medical malpractice, and the impact of insurance. 2 hours or 1/2 unit.
- 304. Torts, II.** A basic course in civil wrongs, including liability of owners and occupiers of land, libel and slander, unfair commercial practices, and products liability. Prerequisite: Law 303. 3 hours or 1 unit.
- 307. Property, I.** The basic first-year course in property law, required of all students. Provides an overview of the law of land, with incidental coverage of personal property; includes the concept of property, acquisition of private property, recognized property interests, gratuitous transfer of property interests, commercial transfers (sale, lease), the use of property, and an introduction to environmental law. 3 hours or 1 unit.
- 308. Property, II.** Continuation of Law 307. 3 hours or 1 unit.
- 309. Criminal Law.** The sources and purposes of the criminal law; the meaning of criminal responsibility; and the characteristics of particular crimes. 3 hours or 1 unit.
- 310. Constitutional Law, I.** Basic principles of American constitutionalism, including the judicial function in constitutional cases; the implementation of the doctrines of

- federalism and separation of powers; the development and exercise of the powers of Congress and the states in the federal union; and the protection of civil rights and liberties. 4 hours or 1 unit.
311. **Civil Litigation, I.** First part of a study of the procedure in the civil courts; includes an overview of the structure of procedure and places particular emphasis on the bases for adjudicatory power (jurisdiction) and the effect of a decision of one case on subsequent litigation between the same or different parties (*res judicata*). 3 hours or 1 unit (summer session, 2 1/2 hours or 1 unit).
315. **Legal Writing and Research.** Emphasis on development and improvement of skills in legal writing; assignments may include brief writing and preparation of legal memoranda and opinions; and training in legal bibliography. 1 or 2 hours.
316. **Moot Court.** Following Law 315, moot court is required in the second semester of the first year for further development of skills in legal research, analysis, and writing. Each student works in a team on the preparation of an appellate brief on a moot court case and then argues the case in appellate argument fashion before a panel of senior students and faculty. 1 hour. No graduate credit.
317. **Moot Court Board.** Preparation of an appellate brief; presentation of an appellate oral argument; participation in intramural, state, national, or international moot court competition. Prerequisite: Law 315 and 316. 1 hour. May be repeated to a maximum of 4 hours. No graduate credit.
318. **Constitutional Law, II.** A detailed study of the history and application of the First Amendment to the Constitution of the United States; focuses on the decisions of the Supreme Court concerning the freedoms of assembly, press, speech, and religion as well as the implied right of association. Prerequisite: Law 310. 3 hours or 1 unit.
319. **Civil Litigation, II.** Continuation of Law 311. Modern civil litigation, with emphasis upon pleading and parties, pre-trial proceedings, trial practice (except evidence), relationship between judge and jury, verdicts and judgments, and appellate review. Prerequisite: First year of J.D. candidacy. 3 hours or 1 unit.
320. **Organizations.** The basic legal consequences for individuals, organizations, and society, of the formation, control, and financing of organizations; includes the agency and employment relationship, unincorporated association, general partnership, limited partnership, closed corporation, public corporation, and non-business organizations. 4 hours or 1 unit (summer session, 3 hours or 1 unit).
322. **Commercial Paper.** A study of major problems involved in commercial paper with special emphasis on the history and interpretation of the Uniform Commercial Code. 2 hours or 1/2 unit (summer session, 2 1/2 hours or 1/2 unit).
323. **Administrative Law.** The functions of administrative tribunals in federal, state, and municipal government; the procedure before such administrative tribunals; and judicial relief from administrative decisions. 3 hours or 1 unit (summer session, 2 1/2 hours or 1 unit).
326. **Evidence.** The law governing the proof of disputed issues of fact; function of the court and jury; competence and examination of witness; standards of relevancy; privileged communications; illegal evidence; hearsay rule; best evidence rule; presumptions; and judicial notice. 3 to 4 hours, or 1 unit (summer session, 3 hours or 1 unit).
327. **Taxation, I.** With Law 328, an integrated survey of federal income and transfer taxes; includes the materials relating to income taxation of individuals and an introduction to taxation of corporations and shareholders. 3 hours or 1 unit.
328. **Taxation, II.** Concludes the survey of the income tax relating to corporations, partnerships, and decedents' estates and trusts and provides a comprehensive treatment of federal transfer (estate and gift) taxes. With Law 327, provides the required background for a number of advanced courses and generally should be elected in regular sequence in the second year. 3 hours or 1 unit (summer session, 2 1/2 hours or 1 unit).
329. **Family Property Transactions.** The means of transferring wealth, with primary emphasis on gratuitous transfers; the means available for making gratuitous transfers, including the validity and effect of testamentary instruments and trust

deeds; and problems concerning the dispositive provisions of any type of instrument which transfers wealth. Prerequisite: Second or third year of J.D. candidacy. 4 hours or 1 unit (summer session, 5 hours or 1 unit).

330. **Remedies.** A survey of legal and equitable remedies for the protection of personal and property rights. Procedural and substantive aspects of injunctions; restitution of unjust enrichment in the context of the receipt of unsolicited benefits, benefits derived from the commission of tortious acts, and the mistaken acquisition of benefits; alternative remedies arising from bargain transactions; and remedies for violations of civil rights. 3 hours or 1 unit.
331. **Legislation.** The first division of the course deals with federal and state constitutional limitations upon the exercise of legislative power in a procedural sense, e.g., investigative powers, legislative structure, requirements relating to enactment of legislation, and role of courts in overseeing legislative action in these areas. The second division of the course deals with the formulation of legislative policy, the relationship of common law principles to legislative policy, and particularly the problems, rules, and methods employed by courts in the interpretation of legislation. 2 to 3 hours, or 1/2 to 1 unit (summer session, 2 1/2 hours or 1 unit).
332. **Patent Law.** Historical development of protection of ideas, inventions, and discoveries; patentability; securing the patent; amendment and correction of patents; and infringement remedies, defenses, and procedures. 2 hours or 1/2 unit (summer session, 2 1/2 hours or 1/2 unit).
333. **Family Law.** The creation and dissolution of the family, legal relationships within the family, and related topics, such as the relationship between illegitimate child and natural parent and legal relationships created by adoption; considers family law aspects of the movement for women's equality; and emphasizes current developments in family law reform. 3 hours or 1 unit (summer session, 2 1/2 hours or 1/2 unit).
334. **Criminal Procedure.** Problems in the administration of criminal justice with emphasis on right to counsel, arrest, search, interrogation, lineups, and the scope and administration of exclusionary rules. Prerequisite: Law 309. 3 hours or 1 unit.
335. **Securities Regulation.** Problems arising under federal securities laws administered by the Securities and Exchange Commission, as well as "blue sky" or state securities laws; emphasis upon statutory and regulatory requirements imposed in connection with corporate financing. Prerequisite: Law 320. 2 or 3 hours, or 1/2 or 1 unit (summer session, 2 1/2 hours or 1/2 unit).
336. **Copyright, Trademark, and Unfair Competition.** The regulation of competitive business behavior at common law and under federal and state statutes; trademarks, copyrights, design patents, trade secrets, protection of ideas, commercial disparagement, false advertising, and price discrimination. 2 to 3 hours, or 1/2 to 1 unit (summer session, 2 1/2 hours or 1/2 unit).
337. **Personal Property Security.** Secured transactions under the Uniform Commercial Code. 2 or 3 hours, or 1/2 or 1 unit (summer session, 2 1/2 hours or 1 unit).
338. **Deferred Compensation.** A detailed study of the law relating to retirement income arrangements; focuses primarily on pension benefit plans that qualify for favorable tax treatment pursuant to subchapter D of the Internal Revenue Code; and includes participation and vesting requirements, taxation of benefit payments, and discrimination in favor of highly compensated employees. Prerequisite: Law 327. 2 or 3 hours, or 1/2 or 1 unit (summer session, 2 1/2 hours or 1 unit).
339. **Conflict of Laws.** The study of problems having relationship with two or more states or nations involving individual litigants or potential litigants; includes such matters as jurisdiction of courts, judgments, torts, workmen's compensation, contracts, property, family relationships, trusts and estates, business organizations, and governmental activities. 3 hours or 1 unit.
340. **Urban Government.** The law governing the structure, powers, and operation of local governments in urban and suburban areas with analysis of political, economic, and social implications. 3 hours or 1 unit (summer session, 2 1/2 hours or 1 unit).

341. **Natural Resources.** Legal problems associated with the use of certain land, water, and mineral resources, including energy sources; emphasizes public management and regulation. 2 or 3 hours, or 1/2 or 1 unit (summer session, 2 1/2 hours or 1 unit).
342. **Real Estate Financing.** Methods of financing land acquisition and residential and commercial development, including publicly owned and subsidized housing. 3 hours or 1 unit.
343. **Problems and Practices of Labor Dispute Settlement.** Same as Economics 443 and Labor and Industrial Relations 443. See Labor and Industrial Relations 443.
344. **Creditors' Rights.** Remedies of individual creditors and collective action by creditors. Individual creditors' remedies include attachment and garnishment, judgment and execution liens, creditors with special rights (taxing authorities, mechanics, and artisans), and debtors exemption rights; collective action includes remedies less drastic than bankruptcy, such as compositions, creditors' agreements, and assignments for the benefit of creditors. Study of the Bankruptcy Act, including property of the bankrupt estate, avoidable transfers, distribution to creditors, discharge, bankruptcy procedure, and an introduction to the rehabilitation provisions of the Act. 2 or 3 hours, or 1/2 or 1 unit (summer session, 2 1/2 hours or 1 unit).
345. **Civil and Political Rights.** Basic problems in the relation of the individual to government and in the protection of the rights of minority groups. 2 hours or 1/2 unit (summer session, 2 1/2 hours or 1/2 unit).
346. **Entertainment Law.** A study of those aspects of law, other than copyright, of particular relevance to the entertainment industries. Includes unfair competition in literary, musical, and artistic works; the protection of ideas by property, quasi-contract, express and implied contract theories; defamation and invasion of privacy arising from depiction of actual persons in literary and artistic works; the right of publicity; and performers' rights. Prerequisite: Completion of first year of J.D. program or consent of associate dean of college. 2 hours or 1/2 unit (summer session, 2 1/2 hours or 1/2 unit).
347. **Labor Law, I.** Same as Labor and Industrial Relations 347. A study of the National Labor Relations Act as amended, the preact history of the labor movement, and the judiciary's response thereto, with emphasis on understanding the problems, experiments, and forces leading to the enactment; includes the negotiation and administration of the collective bargaining agreement, especially the grievance arbitration procedure, its operation and place in national labor policy; and explores the relationship of the individual and the union. Prerequisite: Graduate standing or completion of first year of law curriculum. 3 hours or 1 unit (summer session, 2 1/2 hours or 1 unit).
348. **International Law.** The nature, sources, and subjects of international law and its place in the control of international society; includes an examination of the law of jurisdiction, territory, recognition and succession of states, rights and immunities of states in foreign courts, diplomatic immunities, treaties, protection of citizens abroad, settlement of international disputes, war and neutrality, the United Nations, and the International Court of Justice. 3 hours or 1 unit.
349. **State and Local Taxation.** A survey which stresses the constitutional and statutory bases of state and local tax systems; considers the fiscal and economic policy aspects of the tax structure; and includes the power and purposes of taxation, the operation and administration of the general property tax, jurisdiction of the states to impose various types of taxes, and special problems relating to the operation of income, sales, and business excise taxes. 2 or 3 hours, or 1/2 or 1 unit (summer session, 2 1/2 hours or 1 unit).
350. **Government Regulation.** A study of direct governmental intervention to control business activity in a wide range of industries through regulation of entry, prices, and services; emphasizes the control of price and service discrimination under the Robinson-Patman Act. 2 or 3 hours, or 1/2 or 1 unit (summer session, 2 1/2 hours or 1/2 unit).

351. **Jurisprudence.** The place of law in society; the nature, goals, and methods of law; and the relation of law and social science. 3 hours or 1 unit (summer session, 2 1/2 hours or 1 unit).
353. **Business Planning.** Examination of planning situations wherein tax, corporations, corporate finance, securities regulation, and accounting materials are interrelated; organization of close corporations and public companies, corporate distributions and recapitalizations, sale of corporate businesses, corporate acquisitions and mergers, and corporate separations; and problems requiring written opinions and solutions. Prerequisite: Law 327 and 328. 2 or 3 hours, or 1/2 or 1 unit (summer session, 2 1/2 hours or 1/2 unit).
354. **Employment Discrimination.** Problems arising under federal statutory prohibitions of discrimination in employment, with particular emphasis on evidentiary problems and the use of statistical proofs; defining relevant labor pools, using statistical analyses of data, and establishing proof of test validation. 2 hours or 1/2 unit (summer session, 2 1/2 hours or 1/2 unit).
355. **Antitrust Law.** A study of the limitations imposed by the Sherman Act, Clayton Act, and Federal Trade Commission Act on anticompetitive practices by business firms; emphasizes price fixing, monopolization, mergers, exclusive dealing, tying arrangements, and public and private remedies for violations. 3 hours or 1 unit.
356. **Federal Courts.** Examination of the relationship of federal courts to other organs of federal government and to the states, including an analysis of cases dealing with congressional control over jurisdiction, federal review of state court decisions (including the relationship between state and federal substantive and procedural law), and application of law to fact; the scope of the federal question of jurisdiction in federal courts; abstention; federal injunctions of state criminal proceedings; and problems of justiciability, advisory opinions, and mootness. 3 hours or 1 unit (summer session, 2 1/2 hours or 1 unit).
357. **Accounting Issues for Lawyers.** Introduction to the basic concepts of double-entry and accrual accounting, followed by a critical and comparative appraisal of generally accepted accounting principles in relation to legal concepts governing various business transactions. 1 to 3 hours, or 1/2 to 1 unit (summer session, 3 hours or 1 unit).
358. **Modern Social Legislation.** Examination of the legal structure and underlying economic and social policies of income maintenance programs and proposed reform; includes old age and survivor's insurance under the Social Security Act, governmental regulation of private pension systems supplementing public provision for old age, aid to families with dependent children under the Social Security Act, child welfare provisions, health maintenance provisions, and various other "welfare," "social entitlement," and related income redistribution programs. 2 to 3 hours, or 1/2 to 1 unit.
360. **Legal Drafting and Law Office Practice.** A practical course on the drafting of legal documents; a study of the organization and management of a law office. 2 hours. No graduate credit.
361. **Fundamentals of Trial Advocacy.** Explores the theory and reality of trial practice, from developing a theory of the case through submission of jury instructions; topics include fact gathering, jury selection, opening statements, direct and cross-examination, exhibits, expert witnesses, and closing arguments. Prerequisite: Law 326 and concurrent registration in Law 362. 1 hour.
362. **Trial Advocacy.** Examination of the problems of advocacy and tactics at the trial level. Students engage in actual trial work, including witness preparation, opening and closing statements, direct and cross examination, and jury instructions; demonstrations are conducted by staff and visiting judges and practitioners; and the course culminates with students conducting trials before a judge and a jury. Prerequisite: Second or third year of J.D. candidacy. 1 to 3 hours, or 1/4 to 1 unit (summer session, 2 1/2 hours or 1 unit).
363. **Environmental Law.** The regulatory aspects of environmental law. Environmental impact assessments; control of air pollution, water pollution, noise,

- and toxic substances; the roles of federal and state governments; and citizen participation in and judicial review of public decision-making and enforcement procedures. 3 hours or 1 unit (summer session, 2 1/2 hours or 1 unit).
364. **Urban Planning and Land Use Regulation.** The legal and administrative aspects of land development and regulation in an urban society; the techniques and problems of planning; the tools of plan effectuation, such as zoning, subdivision regulation, renewal and redevelopment, housing programs; and the allocation of decision-making functions among various levels of government. 3 hours or 1 unit (summer session, 2 1/2 hours or 1/2 unit).
365. **Taxation of Business Enterprises.** An in-depth study of federal income tax law related to taxation of corporations, shareholders, partnerships, and partners. Prerequisite: Law 320, 327, and 328. 3 hours or 1 unit (summer session, 2 1/2 hours or 1 unit).
366. **Advocacy Workshop.** Exposes students to the theory and reality of client interviewing and counseling, preparation of pleadings, and motion practice; devotes segments of the course to the preparation and conduct of a deposition; and discusses negotiation and settlement procedures and techniques. Prerequisite: Law 326 and concurrent registration in Law 362. 1 hour.
369. **Soviet Law.** Soviet conceptions of the role of law in theory and in practice; highlights of Soviet law, with comparison to the common law and civil law traditions; and study of Soviet court and legislative materials. 2 to 3 hours, or 1/2 to 1 unit (summer session, 2 1/2 hours or 1 unit).
370. **Labor Law, II.** Advanced problems in the law of industrial relations, with particular emphasis on the negotiation and administration of the collective bargaining agreement; the relation between the individual and the union. Prerequisite: Law 347 or consent of instructor. 2 hours or 1/2 unit (summer session, 2 1/2 hours or 1/2 unit).
371. **Seminar in Selected Legal Problems.** Introduction to the methods and materials of legal research; discussion of selected topics; each student investigates a topic approved by the instructor and presents the results of the investigation orally to the class and in writing to the instructor. 2 hours or 1/2 unit (summer session, 2 1/2 hours or 1/2 unit). May be repeated.
372. **Problems in Estate Planning.** Selected problems in the planning of estates which will serve to integrate the basic materials in property, trusts, wills, income, estate, and gift taxation. Prerequisite: Law 327, 328, and 329. 2 to 3 hours, or 1/2 to 1 unit (summer session, 2 1/2 hours or 1 unit).
373. **Advanced Criminal Procedure.** Problems in the administration of criminal justice, with emphasis upon the commencement of formal proceedings (bail, decision to prosecute, grand jury, preliminary hearing, location of prosecution, scope of prosecution, speedy trial); the adversary system (pleas, discovery, jury trials, prejudicial publicity, ethical problems, double jeopardy); and post-conviction review (post-trial motions, appeals, habeas corpus, related post-conviction remedies). Prerequisite: Law 309 and 310. 3 hours or 1 unit (summer session, 2 1/2 hours or 1/2 unit).
374. **Advanced Torts.** Focuses on the traffic victim and his claim for compensation; compares the present common law method with various schemes of social insurance, such as workmen's compensation, accident and health insurance, and Social Security. 2 or 3 hours, or 1/2 or 1 unit (Summer Session, 2 1/2 hours or 1 unit).
375. **Government Contracts.** A study of the way the United States does business; differences in dealing with the government as compared to private parties; awarding of contracts and contractual clauses, especially those allocating risks; and adjudication of contract disputes. 3 hours or 1 unit (summer session, 2 1/2 hours or 1 unit).
376. **Labor Law and Public Policy.** Same as Labor and Industrial Relations 451. See Labor and Industrial Relations 451.
377. **Consumer Credit.** Existing patterns and proposed changes in consumer credit law; finance charge regulations, special licensing for merchandisers of consumer credit, disclosure of finance charges, door to door selling, home improvement

financing, cutting off defenses, creditor remedies problems including garnishment, wage assignments, and deficiency judgments, and administrative control of creditor practices. Prerequisite: Law 322. 2 hours or 1/2 unit.

378. **Juvenile Courts.** The laws relating to juveniles, including the historical relationship of the criminal law with children; the evolution of state and federal decisional law providing for the special handling of children under specified ages who engage in conduct deemed to be "linquent"; emphasis on the procedural and constitutional rights of children accused of wrongful conduct. Prerequisite: Law 309. 2 hours or 1/2 unit (summer session, 2 1/2 hours or 1/2 unit).
379. **Law of Corrections and Prisoners' Rights.** An examination of the present system of corrections, including a study of procedural and substantive rights of incarcerated persons; the sentencing process; post-conviction remedies and programs, focusing on probation and parole; and alternatives to the present system. Prerequisite: A basic course in criminal law and procedure. 3 hours or 1 unit (summer session, 2 1/2 hours or 1 unit).
380. **Labor Law, III.** Legal problems and practical aspects of the enforcement and administration of collective bargaining agreements; emphasizes judicial enforcement of labor contracts under Section 301 of the National Labor Relations Act and administration of the labor contract by the parties under the contract's own grievance and arbitration provisions. Prerequisite: Law 347. 2 hours or 1/2 unit.
382. **Comparative Law.** Comparative law is a method, an approach to legal problem solving, rather than a subject matter in the traditional sense. The course attempts to sharpen the student's perceptions of the student's own law; it is not primarily concerned with specific rules of foreign law or with proficiency in a specific foreign legal system. 2 hours or 1/2 unit (summer session, 2 1/2 hours or 1 unit).
383. **Law of Professional Responsibility.** A study of ethical issues arising in the practice of law with particular reference to the requirements of the American Bar Association Code of Professional Responsibility. Prerequisite: Second year of J.D. candidacy. 1 or 2 hours, or 1/2 unit (summer session, 2 1/2 hours or 1 unit).
384. **Current Legal Problems.** Intensive study of current legal problems; based upon recent court decisions, recent legislation, pending law reform proposals, or empirical studies; subject matter varies from semester to semester. 3 hours or 1 unit (summer session, 2 1/2 hours or 1 unit).
385. **International Business Transactions.** Doing business abroad: export-import regulations, use of foreign commission merchants, licensing of patents and know-how, investment and exchange problems, establishing a foreign operation (including forms of business organization available abroad), and application of United States and foreign antitrust law to the business operation. Prerequisite: Law 322. 3 hours or 1 unit (summer session, 2 1/2 hours or 1/2 unit).
386. **Taxation of International Transactions.** Survey of the problems in U.S. taxation of foreign persons and foreign income, with special emphasis upon foreign business transactions of U.S. corporations. Prerequisite: Law 328. 2 or 3 hours, or 1/2 or 1 unit (summer session, 2 1/2 hours or 1 unit).
387. **Common Market Law.** A survey of the principal international economic organizations (GATT, OECD, ECE) and of international monetary and investment institutions (IMF, IBRD, AID); an intensive study of the European Common Market, particularly of its laws relating to trade barriers, establishment of companies, and antitrust; and United States legislation in the field of international trade (Trade Expansion Act of 1962). 2 or 3 hours, or 1/2 or 1 unit (summer session, 2 1/2 hours or 1 unit).
388. **Law and Psychiatry.** Contemporary psychiatric theory and its relevance to various legal issues; psychiatric disorders, their etiology and treatment; and problems of prediction and prevention of deviant behavior in the context of the administration of the criminal and mental health laws. 3 hours or 1 unit (summer session, 2 1/2 hours or 1 unit).
389. **Corporate Finance.** The impact of legal regulation and financial theory on the formation, financing, and value of corporations; alternative methods for utilization of

- surplus funds; and controls over transactions in shares. Prerequisite: Second year of J.D. candidacy. 2 or 3 hours, or 1/2 or 1 unit (summer session, 2 1/2 hours or 1/2 unit).
390. **Insurance.** Concentration on such fundamentals as the formation of the insurance relation and the principle of indemnity; includes persons and interests protected, the risks transferred, rights at variance with policy provision, claims processes, and regulation of insurance. Assignments outside of class consist of a programmed set of technical legal problems; classroom lectures supplement the problems, often focusing on broader aspects of the subject matter. Prerequisite: Second year of J.D. candidacy. 2 hours or 1/2 unit (summer session, 2 1/2 hours or 1 unit).
391. **Legal Problems.** Preparation of comments on recent decisions for publication in the University of Illinois Law Forum. Open to students selected for superior achievement in two or more semesters of law study. 1 hour. May be repeated. No graduate credit.
395. **Clinical Training.** Student field work in the offices of the Champaign County Legal Services Agency, Vermilion County Legal Services Agency, Champaign Human Relations Commission, local City Attorneys, State of Illinois Department of Mental Health, Champaign County State's Attorney, Champaign County Public Defender, and other public agencies. Students engage in legal and investigative work under the supervision of agency attorneys or other administrative personnel; this work may include conducting client interviews, doing legal research, preparing legal documents, pleadings, and briefs, and in some cases, engaging in the trial of actual cases. 1 hour. May be repeated up to four times. No graduate credit.
399. **Research in Special Topics.** Individual research on a special problem selected in consultation with the instructor. 0 to 4 hours, or 1/2 to 1 unit.
402. **Introduction to United States Law.** An intensive introduction to the American legal system for graduate law students with prior professional training in non-common law legal systems; stresses the functioning of basic U.S. legal institutions and the techniques of American legal research. 1 unit.
499. **Thesis Research.** 0 to 3 units

LEISURE STUDIES

Head of Department: Professor J. J. Bannon

Department Office: 104 Huff Gymnasium, 1206 S. Fourth Street, Champaign

100. **Introduction to Leisure Studies.** Central issues in defining leisure and providing for its realization; historical, philosophical, sociological, psychological, and economic approaches to understanding leisure behavior, its meanings, social contexts, and personal and social resources. 3 hours.
110. **Foundations for Delivery of Leisure Services.** Introduces the leisure studies major to enabling legislation, fiscal concerns, standards for planning, problems of cities, and the relationship of professional organizations to recreation and park services. 2 hours.
130. **Introduction to Therapeutic Recreation.** A survey of the history, philosophy, concepts, and trends in therapeutic recreation; types of special populations served; settings and services; role of therapeutic recreators; and play theories as related to therapeutic recreation. 2 hours.
140. **Camping and Outdoor Education.** Basic philosophy and principles of outdoor/environmental education; practice in developing program skills; writing objectives; and conducting evaluations. 3 hours.
141. **Introduction to Outdoor Recreation.** Philosophy, policy, history, and trends in the provision of all types of outdoor recreation opportunities; management and planning principles for the various organizational structures involved. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.

200. **Leadership in Leisure Delivery Systems.** Introduces the student to the various theories of leadership applicable to situations that exist in the field of leisure studies; provides practice in various leadership settings and techniques for the evaluation of leadership performance. 3 hours.
210. **Theories and Methods of Supervision.** Concepts, principles, and objectives of supervision; the nature of the supervisory relationship; supervisory functions and processes; identification and application of methods and techniques; and organizational and operational patterns of supervision in recreation and park settings. Prerequisite: Leisure Studies 100 and 110, or consent of instructor. 3 hours.
215. **Recreation Program Development.** Theory and practice in recreation program development in the various recreation settings, including public, private, and commercial operations; core programming and programming dictated by the needs of the field, setting, or clientele; and program evaluation. Prerequisite: Leisure Studies 100 and 200, or consent of instructor. 3 hours.
230. **Clinical Aspects of Therapeutic Recreation.** A survey of basic concepts associated with the clinical application of therapeutic recreation services, including an investigation of illness and disabilities basic medical and psychiatric terminology, adaptive devices and appliances, assistive techniques and record keeping and behavior reporting. Prerequisite: Leisure Studies or consent of instructor. 4 hours.
231. **Leisure and the Aging.** In-depth study of concepts and theories of aging as related to recreation settings; roles, stereotypes, and characteristics of the elderly; service delivery systems; activity adaptation; legislation; and issues and trends. Prerequisite: Leisure Studies 230 or consent of instructor. 3 hours.
232. **Principles of Therapeutic Recreation.** Practices and principles utilized in therapeutic recreation; includes professionalism, legislation, team approaches, activity analysis, supervisory functions, community resources, and special recreation programs. Prerequisite: Leisure Studies 230. 3 hours.
233. **Recreation for the Physically Disabled.** In-depth study of all aspects of physical disability as related to therapeutic recreation settings; includes services, assessability, implications of disability, self-help skills, wheelchair activities, coaching techniques, legislation, and adaptive techniques. Prerequisite: Leisure Studies 230 or consent of instructor. 3 hours.
234. **Recreation for the Mentally Ill and Emotionally Disturbed.** In-depth study of mental illness and emotional disturbance as related to therapeutic recreation settings; characteristics and classification of mental illness; and service delivery systems, activity adaptation, legislation, treatment approaches, issues and trends, and standard evaluation instruments. Prerequisite: Psychology 238 and Leisure Studies 230, or consent of instructor. 3 hours.
235. **Recreation for the Developmentally Disabled.** In-depth study of all aspects of mental retardation as related to therapeutic recreation services; characteristics of mental retardation; learning theories and treatment approaches; and service delivery systems, adaptive techniques, mainstreaming, normalization, and standard evaluation instruments. Prerequisite: Psychology 216 or Special Education 117, and Leisure Studies 232; or consent of instructor. 3 hours.
239. **Seminar in Therapeutic Recreation.** A seminar for senior therapeutic recreation majors to discuss and explore current issues, trends, and professional concerns in the field of therapeutic recreation. Prerequisite: Senior standing. 1 hour.
240. **Operation and Maintenance of Parks.** Basic understanding of park operations, facility design, construction, and maintenance practices; staff allocations, job analysis, contract administration, and organizational structures. Prerequisite: Leisure Studies 100, 110, and 141. 3 hours.
241. **Outdoor Recreation Consortium.** Intensive on-site study of programs and management of large multiple-use recreation areas; includes lectures, problem solving, and interaction with personnel from various responsible agencies. Prerequisite: Leisure Studies 141 and 240; Landscape Architecture 226, or consent of instructor. 2 hours. May be repeated to a maximum of 6 hours.

250. **Special Problems.** Special projects in research and independent investigation in any phase of health, physical education, recreation, or related areas selected by the student. Prerequisite: Junior or senior standing; grade-point average of 3.5; consent of faculty adviser, instructor, and head of department. 2 to 3 hours. May be repeated for a maximum of 4 or 6 hours.
260. **Honors Seminar.** Same as Health Education 260 and Physical Education 290. See Physical Education 290.
272. **Organization of Aquatic Programs.** Same as Physical Education 272. See Physical Education 272.
274. **Urban Leisure Systems.** Orientation to the urban and inner-city setting and to the role of leisure within this community; methods and techniques effective in out-reach programs; guest lecturers in related fields such as urban planning, social work, etc.; guest speakers from local community; field trips and field experience; and readings from several disciplines as relevant. Prerequisite: Advanced undergraduate standing or consent of instructor. 3 hours.
280. **Orientation to Practicum.** Prepares and places students in the Leisure Studies Practicum. Students must document completion of 320 hours of field work. Topics include placement requirements and policies, vitas, interviewing, letters of application, and the role and issues of professional practice. Prerequisite: Junior standing; Leisure Studies 100, 110, 130, and either 200 or 230. 0 credit.
284. **Leisure Studies Practicum.** Students are assigned to University-approved field training stations in an internship capacity for a minimum of forty hours per week for sixteen weeks. Both the agency and the University provide supervision. Prerequisite: Senior standing; Leisure Studies 280 and 310. 12 hours.
290. **Research in Leisure Studies.** The place of research in recreation and parks; research design; data collection, processing, and analysis; use of completed research; and development of an appreciation of and an ability to evaluate and utilize research rather than an ability to conduct research. Prerequisite: Senior standing; consent of instructor. 3 hours.
299. **Off-Campus Study.** Provides campus credit for foreign or domestic study completed off-campus. A student's proposal for study must have prior approval of the major department and the college office. Final determination of appropriate credit is made on the student's completion of the work. Prerequisite: Advanced standing and approval of major department and college. 0 to 16 hours (summer session, 0 to 8 hours). May be repeated to a maximum of 32 hours.
301. **Forest Recreation.** Same as Forestry 301. See Forestry 301.
310. **Introduction to Administration.** Organization of public and private agency programs, leadership, facilities, and services; introduction to recreation administration. Prerequisite: Leisure Studies 210 and senior standing, or consent of instructor. 3 hours, or 1/2 or 1 unit.
315. **Play Theories and Their Implications.** Classical and modern theories of play; critical analysis of definitions, concepts, and assumptions and of extant research and research strategies; implications for programming and planning for play. Prerequisite: Leisure Studies 100 and Psychology 100, 103, or 105; or consent of instructor. 2 to 4 hours, or 1/2 to 1 unit.
331. **Facilitation Techniques and Leisure Education.** Philosophy, theory, and applications of leisure counseling, including applications to special populations; includes specific techniques of leisure counseling and reviews traditional counseling theories and techniques for their relevance to leisure counseling settings. Prerequisite: Leisure Studies 232 and junior standing, or consent of instructor. 3 hours or 1 unit.
332. **Program Design and Evaluation in Recreation.** Study of systematic program design and evaluation, including systems approach, discrepancy evaluation models, problem solving by objectives, management by objectives, and accountability. Prerequisite: Leisure Studies 130 and senior standing, or consent of instructor. 3 hours or 1 unit.
340. **Outdoor Recreation Management.** Principles, practices, and problems involved in managing outdoor recreation areas; includes organizations, laws, regulations,

programs, facilities, and services. Prerequisite: Landscape Architecture 226 and Leisure Studies 141, or consent of instructor. 3 hours, or 1/2 or 1 unit.

341. **Recreational Use of Public Lands.** Study of lands in the public domain and their historical, current, and potential use for outdoor recreation; an analysis of land, woods, and water in the public domain; the demand for outdoor recreation; multiple-use concept of natural resources; functions and policies of federal and state governments and their agencies; the economics of outdoor recreation; and the future of outdoor recreation in America. Prerequisite: Leisure Studies 141, Geography 214, and junior standing; or consent of instructor. 3 hours, or 1/2 or 1 unit.
348. **Social Problems Related to Physical Activity and Sport.** Same as Physical Education 348. See Physical Education 348.
349. **Analysis of Small Groups in Play and Sport.** Same as Physical Education 349. See Physical Education 349.
381. **Management Internship.** Work-study experience in the management aspects of leisure service delivery systems. Students are assigned to agencies in their special fields of study and are closely supervised by University faculty. Prerequisite: Leisure Studies 284 or graduate standing. 2 to 4 hours, or 1/2 to 1 unit.
401. **Foundations of Leisure Studies.** Basic philosophical, historical, and scientific foundations and developments in leisure and recreation; analysis of recreation values as related to other contemporary individual and community needs; and functions and settings of organized recreation, special problem areas, and current issues. Prerequisite: Leisure Studies 100 or equivalent. 1 unit.
402. **Leisure Systems Administration.** Strengthens the graduate student's knowledge of the public administration of recreation programs and services provided by municipal, county, state, and national departments and agencies as related to the general well-being of individuals, families, and communities. Prerequisite: Basic course in the organization of recreation or equivalent. 1 unit.
403. **Evaluation of Leisure Resources and Programs.** Methods and techniques of determining recreational needs, interests, and opportunities of individuals and communities through surveys, studies, and appraisals; evaluation and appraisal of community recreation programs and services; and research in the field of recreation. Prerequisite: Leisure Studies 100 or 310, or equivalent; a course in tests or measurement statistics. 1 unit.
404. **Outdoor Education and Recreation.** Philosophy, essential principles, methods, techniques, resources, administrative and program practices for outdoor education and recreation. Prerequisite: Leisure Studies 140 or equivalent; one undergraduate course in any one of the following: biology, botany, geology, or zoology. 1 unit.
430. **Advanced Seminar in Therapeutic Recreation.** In-depth investigation of contemporary professional issues characteristic of the practice of therapeutic recreation in both public and private institutional and community programs for the handicapped. Prerequisite: Leisure Studies 332 or consent of instructor. 1 unit.
445. **Sociology of Leisure.** Same as Sociology 445. Sociological theory and research methods as applied to the study of leisure; includes institutional and community contexts of leisure, leisure roles and socialization, built and natural environments, and the relationships of leisure to family, work, subcultures, and resources. Prerequisite: Leisure Studies 401 or Sociology 386 or 415, or consent of instructor. 1 unit.
490. **Seminar.** Student presentation of thesis studies, informal discussions, and critical analysis of problems; informal lectures by invited speakers. 0 credit.
493. **Special Problems.** Independent research on special projects. Open only to students majoring in leisure studies. 1/2 to 2 units.
494. **Special Topics in Leisure Studies.** Lecture courses in topics of current interest; specific subject matter will be announced in the Timetable. Prerequisite: Will be determined for each course offered and will be indicated in the Timetable. 1/2 or 1 unit.
499. **Thesis Research.** Preparation of thesis in leisure studies. 0 to 4 units

LIBERAL ARTS AND SCIENCES

Program Administrator: Professor R. K. Applebee

Program Office: 294 Lincoln Hall, 702 S. Wright, Urbana

110. **Workshop-Tutorial.** Independent study and experimental seminars open to Unit One students and to others; specific offerings vary each semester. Prerequisite: Allen Hall residency or consent of Unit One director. 1 to 4 hours. At the end of the semester, the instructor may increase or decrease credit up to 2 hours, i.e., for a maximum credit of 6 hours. Credit toward college or departmental requirements is contingent upon approval of the appropriate unit. In any given semester, a student may register only for Liberal Arts and Sciences 110 (4 hour limit) or 210. A combined total of 12 hours of Liberal Arts and Sciences 110 and/or 210 credit may be applied toward graduation in the College of Liberal Arts and Sciences.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
210. **Experimental Seminar.** Seminars which are experimental in content or method of delivery, open to Unit One students and to others; special topics and independent research with individual faculty sponsors in areas not treated by regular course offerings, or in areas within the expertise of Unit One staff. A catalog of seminar offerings is available each semester from the Unit One office prior to registration. Prerequisite: Sophomore standing; Allen Hall residency or consent of Unit One director. 3 hours. Credit toward college or departmental requirements is contingent upon approval of the appropriate unit. In any given semester, a student may register only for Liberal Arts and Sciences 110 (4 hour limit) or 210. A combined total of 12 hours of Liberal Arts and Sciences 110 and/or 210 credit may be applied toward graduation in the College of Liberal Arts and Sciences.
299. **LAS Study Abroad.** Provides credit toward the undergraduate degree for study at accredited foreign institutions or approved overseas programs. Final determination of credit is made on the student's completion of the work. Prerequisite: One year of residence at UIUC, good academic standing, and prior approval of the major department and the College of Liberal Arts and Sciences. 0 to 15 hours (summer session, 0 to 8 hours). May be repeated to a maximum of 30 semester hours per academic year or to a total of 36 semester hours, all of which must be earned within one calendar year

LIBRARY AND INFORMATION SCIENCE

Dean of Graduate School of Library and Information Science: Professor C. H. Davis

School Office: 410 David Kinley Hall, 1407 W. Gregory, Urbana

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
300. **Foundations of Library and Information Science.** Examines the development of the library and information centers in relation to the society they serve, the library and information science profession, the operation and organization of libraries and information centers, building collections, and the administration of libraries and information centers; serves as an orientation to library and information science. Prerequisite: Consent of the School. 4 hours or 1 unit.
301. **Bibliography.** Covers enumerative bibliography, the practices of compiling lists; analytical bibliography, the design, production, and handling of books as physical objects; and historical bibliography, the history of books and other library materials, from the invention of printing to the present. Prerequisite: Library and Information Science 300 or consent of instructor. 3 hours, or 1/2 or 1 unit.
303. **Library Materials for Children.** Selection and use of library materials for children in public libraries and elementary school media centers, according to their needs in their physical, mental, social, and emotional development; deals with the

- standard selection aids for all types of print and nonprint materials and develops the ability to select and describe children's materials according to their developmental uses. Students may not receive credit for both Library and Information Science 303 and Elementary and Early Childhood Education 304. Prerequisite: Library and Information Science 300 or consent of instructor. 3 hours, or 1/2 or 1 unit.
304. **Library Materials for Young Adults.** Evaluation, selection, and use of library materials for young adults in school and public libraries and community organizations, according to personal and curricular needs; studies selection sources for all formats of materials and explores techniques for utilization of materials. Prerequisite: Library and Information Science 300 or consent of instructor. 3 hours, or 1/2 or 1 unit.
307. **Introduction to Services Relating to Organization of Library Materials.** Emphasizes the role of library catalogs in bibliographic control; introduces the functions, forms, and arrangements of library catalogs in all types of libraries; identifies bibliographic data elements in manual and machine readable catalog records; and emphasizes the basic principles, concepts, practices, and tools of descriptive and subject cataloging and file structures. Prerequisite: Consent of the School. 2 hours or 1/2 unit.
308. **Audiovisual Services in Libraries.** Designed to acquaint students with the nonprint media responsibilities of libraries; includes the evaluation, selection, and acquisition of software and hardware, the utilization of media in various types of libraries (by individuals and groups, in formal and informal programs), and the administration of integrated media collections (films, recorded sound, video, and exhibits). Prerequisite: Library and Information Science 300 or consent of instructor. 3 hours or 1 unit.
309. **Storytelling.** Fundamental principles of the art of storytelling including techniques of adaptation and presentation; content and sources of materials; story cycles; methods of learning; practice in storytelling; and planning the story hour for the school and public libraries, for recreational centers, for the radio, and for television. Prerequisite: Consent of instructor. 3 hours, or 1/2 or 1 unit.
310. **Typographic Disciplines of the Book.** The study of the book as a manufactured object; emphasis on practices and methods in continuous use from the Renaissance to the present, including type faces, paper, binding, and illustration; and extensive practicum in the typographic laboratory. Prerequisite: Consent of instructor. 3 hours or 1/2 unit.
320. **Introduction to Information Sources and Services.** Introduces information referral techniques and readers' advisory and online information services; examines representative printed and online sources, and develops question negotiation skills and search strategies. Prerequisite: Consent of the School. 2 hours or 1/2 unit.
350. **The Theory, Design, and Production of Audiovisual Materials.** Examines the theory and research related to the design and production of audiovisual materials and their application to the design and production of graphic materials, films, sound-slide programs, and television programs; also treats the management of audiovisual production services in libraries. 3 hours or 1 unit.
360. **Practicum.** Supervised field experience, in an approved library, of professional-level duties; intended primarily for M.S. candidates without work experience in libraries. Prerequisite: Library and Information Science 300 and completion of 5 units of library and information science courses. 2 hours or 1/2 unit.
405. **Library Administration.** Designed to supply knowledge of the internal organization of libraries and of the principles of library administration; emphasis on comparison of the conditions found in the several kinds of libraries and on applications of the general theory of administration. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.
406. **Media Programs and Service for Children and Young Adults.** The role, problems, and needs of children's and young adults' library services in the school and public library. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.

407. **Cataloging and Classification, I.** Theory and application of basic principles and concepts of descriptive and subject cataloging; emphasis on interpreting catalog entries and making a catalog responsive to the needs of users; provides beginning-level experience with choice of entries, construction of headings, description of monographs (and, to a lesser extent, of serial publications and nonprint media), filing codes, Dewey and Library of Congress classification systems, and Library of Congress subject headings. Prerequisite: Library and Information Science 300. 1 unit.
408. **Cataloging and Classification, II.** More complex problems in making and evaluating the changing, modern library catalog; practical and administrative problems in cataloging serial publications, analytics, ephemeral materials, and microforms; deals with various nonprint media, rare books and manuscripts, foreign language materials, and materials in special subject areas. Prerequisite: Library and Information Science 407. 1 unit.
409. **Communication Roles and Responsibilities of Libraries.** Consideration of mass media of communication in terms of their relations with modern library services; review of media organization, content, and research; consideration of problems of intellectual freedom as an aspect of communications behavior; and discussion of the potential role of electronic devices in library activities now and for the future. 1/2 or 1 unit.
410. **Adult Public Services.** The literature, history, and problems of providing library service to the general adult user; investigation of user characteristics and needs, and the effectiveness of various types of adult services. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.
411. **Reference Service in the Humanities and Social Sciences.** Detailed consideration of the bibliographical and reference materials in various subject fields; training and practice in their use for solving questions arising in reference service. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.
412. **Scientific and Technical Literature and Reference Work.** Aims (a) to acquaint students with typical library materials in science and technology, and (b) to develop proficiency in their selection, evaluation, and use for reference work. Prerequisite: Library and Information Science 320, or consent of instructor. 1 unit.
415. **Library Automation.** Introduction to various types of equipment for handling information and providing services in libraries; study of applications to library operations; and introduction to systems planning, to automation concepts, and to computer use. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.
416. **Advanced Library Automation.** The development of computer programs for library technical processes such as circulation, acquisitions, serials control, cataloging, and the analysis of library computer networks and data bases; includes seminar presentations based on individual research in automation topics. Prerequisite: Library and Information Science 415. 1/2 or 1 unit.
424. **Government Publications.** Aims to acquaint students with government publications, their variety, interest, value, acquisition, and bibliographic control, and to develop proficiency in their reference and research use; considers publications of all types and all governments (local, national, international) with special emphasis on U.S. state and federal governments and on the United Nations and its related specialized agencies. Prerequisite: Library and Information Science 411, 412, or consent of instructor. 1 unit.
427. **Resources of American Research Libraries.** Acquaints students with the distribution and extent of American library resources for advanced study and research; spatial and financial aspects of library resources; methods of surveying library facilities; growth and use of union catalogs and bibliographical centers; interinstitutional agreements for specialization of collections and other forms of library cooperation; and the use of the research collection by the scientist and scholar. Prerequisite: Library and Information Science 300 or consent of instructor. 1/2 or 1 unit.

- 428. Library Buildings.** Study of the library's physical plant in the light of changing concepts and patterns of library service; analysis of present-day library buildings, (both new and remodeled) and their comparison with each other as well as with buildings of the past; examination of the interrelationship of staff collections, users, and physical plant; and discussion supplemented by visits to new libraries and conference with their staffs. A two-day field trip is required; see Timetable for estimated cost. Prerequisite: Library and Information Science 405 or consent of instructor. 1/2 or 1 unit.
- 429. Information Storage and Retrieval.** Types of systems for storage and retrieval of documents and references; history of retrieval systems, their characteristics, evaluation, and factors affecting their performance, with special reference to modern computer-based systems; procedures in the dissemination of scientific and other information; major information centers and services in the U.S. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.
- 430. Advanced Reference.** Enables the student to utilize the varied resources of a large research library; deals with the methods of analyzing and solving bibliographic problems such as arise in scholarly libraries and in connection with research projects. Prerequisite: Library and Information Science 411 or 412, and consent of instructor. 1/2 or 1 unit.
- 431. Online Information Systems.** Explores the state-of-the-art in online information systems, with particular emphasis on their use as part of reference service in libraries; acquaints students with the characteristics of both bibliographic and nonbibliographic data bases; and trains students in the use of at least one currently available online retrieval system. Prerequisite: Library and Information Science 429. 1/2 unit.
- 432. History of Libraries.** Same as Communications 432. The origins, development, and evolution of libraries and related institutions, from antiquity to the twentieth century, as a reflection of literacy, recognition of archival responsibility, humanistic achievement, scientific information needs, and service to society. Prerequisite: Library and Information Science 300 or consent of instructor. 1/2 or 1 unit.
- 433. Advanced Subject Bibliography.** Study of the literature, information sources, and reference aids in various specialized fields of knowledge, identified as different sections of this course, from the point of view of their use by librarians. Prerequisite: Consent of instructor. 1/2 unit. May be repeated for a total of 1 unit.
- 434. Library Systems.** Development of library systems, with special reference to public libraries as a norm for the development of library services; detailed treatment of library standards, the growth and development of county and regional libraries, and the role of the state library and of federal legislation. Prerequisite: Library and Information Science 405 or consent of instructor. 1 unit.
- 435. Library Services to Specialist Users.** In-depth study of goals and objectives, policy, and services of research-oriented libraries; of characteristics and information needs of specialist users of these libraries; and of effective library services that satisfy specialist user needs. Study is based on actual library operations according to subject interest of student. Prerequisite: Library and Information Science 411 or 412. 1 unit.
- 438. Administration and Use of Archival Materials.** Administration of archives and historical manuscripts; emphasis on the processing and research use of archival materials. Prerequisite: Consent of instructor. 1 unit.
- 439. Medical Literature and Reference Work.** Consideration of representative reference and bibliographical aids in medical sciences; problems provide experience with typical medical reference sources. Prerequisite: Consent of instructor. 1 unit.
- 440. Advanced Bibliography.** Discusses the major reference bibliographies, including general works, subject lists in various fields, regional historical and current national bibliographies, and published library catalogs; surveys the nature of bibliographical access to the output of the world's press, descriptive bibliography, and rare-book librarianship. Prerequisite: Library and Information Science 301 or consent of instructor. 1/2 or 1 unit.

441. **History of Children's Literature.** Interpretation of children's literature from the earliest times, including the impact of changing social and cultural patterns on books for children; attention to early printers and publishers of children's books and to magazines for children. 1 unit.
442. **Seminar in Library Materials for Children and Young Adults.** Advanced study of criteria for the evaluation of books and other media, including an individual project on a given theme or subject involving extensive critical reading, viewing, and listening. Prerequisite: Library and Information Science 303, 304, or consent of instructor. 1 unit.
443. **Contemporary Book Publishing.** Survey of twentieth-century book publishing, placing it in an economic, social, and literary context; emphasis on economic structure, the relationship of author and publisher, promotion, distribution, and the influence of the industry on librarianship. Prerequisite: Library and Information Science 300 or consent of instructor. 1/2 or 1 unit.
444. **Measurement and Evaluation of Library Services.** Methods and criteria for evaluating various facets of library service, including the collection, the catalog, document delivery capabilities, reference service, technical processes, and information retrieval operations; deals with cost-effectiveness considerations. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.
445. **Vocabulary Control of Information Retrieval.** The construction, characteristics, and application of controlled vocabularies for use in information retrieval systems; covers a full range of vocabulary control possibilities from highly structured thesauri and classification schemes to natural-language (free text) searching; special emphasis on the thesaurus and vocabulary control in computer-based systems. Prerequisite: Library and Information Science 429. 1 unit.
450. **Advanced Problems in Librarianship.** Directed and supervised investigation of selected problems in library resources, reference service, research libraries, reading, public libraries, or school libraries. 1/4 to 2 units.
451. **Independent Study.** Permits the intermediate or advanced student opportunity to undertake the study of a topic not otherwise offered in the curriculum or to pursue a topic beyond or in greater depth than is possible within the context of a regular course. Prerequisite: Consent of dean. 1/2 to 1 unit. May be repeated by M.S. students to a maximum of 1 unit; C.A.S. students, 2 units; or Ph.D. students, 4 units.
459. **CAS Project.** Individual study of a problem in library or information science; forms the culmination of the Certificate of Advanced Study program. Prerequisite: Admission to CAS program in library and information science. 0 to 2 units. May be taken for additional units, but only two will apply to the Certificate of Advanced Study.
460. **Special Topics in Librarianship.** An advanced seminar on topics of individual choice; presentation and criticism of written research reports based on individual study on an advanced level; and sections or practicum in research methods offered in the following areas: (a) historical, I; (b) survey; (c) observation; (d) experimental; and (e) historical, II. Students may enroll in a maximum of two sections, concurrently or consecutively. Open to doctoral students only. Prerequisite: Library and Information Science 469 or consent of instructor. 1/2 to 2 units.
469. **Principles of Research Methods.** The study of the design of research using historical, descriptive, and experimental methodologies; emphasizes applications in the library and information science fields. For doctoral students only. Prerequisite: A course in the principles of statistics, a library and information science course in quantitative methods; and consent of instructor. 1 unit.
471. **The History of Communications Media and Libraries.** Seminar in the different means of transmitting content through time and space; includes the history and comparison of libraries, books, and other communications media. Prerequisite: Open to doctoral students only. 1 unit.
472. **The Bibliographic Organization of Information and Library Materials.** Seminar in the relationship between knowledge and its bibliographic control, includes the structure of knowledge and classification, the descriptive and subject aspects of

bibliography and indexing, and information theory. Prerequisite: Open to doctoral students only. 1 unit.

473. **The Social Basis of Library and Information Science.** Seminar in the interrelationships between librarians and information scientists and their communities of users; includes modern institutions of librarianship and information service, the education of librarians and information scientists, and the sociology of libraries and information centers. Prerequisite: Open to doctoral students only. 1 unit.
474. **The Management of Libraries and Information.** Seminar in the organizations and structures which facilitate both the achievement of library and information center goals and the flow of information; includes management and decision-making tools. Prerequisite: Open to doctoral students only. 1 unit.
475. **Seminar in Library and Information Science.** Preparation, presentation, and criticism of a scholarly paper of moderate length and publishable quality based on individual study. Prerequisite: Library and Information Science 471, 472, 473, or 474; open to doctoral students only. 1 unit. Required: To be repeated for a total of 4 units.
499. **Thesis Research.** Individual study and research. Section A: M.S. candidates, 0 to 2 units. Section B: doctoral candidates, 0 to 4 units

LIFE SCIENCES, SCHOOL OF

(Please refer to individual alphabetical listings: Anatomical Sciences, Biology, Botany, Ecology, Ethology, and Evolution, Genetics and Development, Microbiology, and Physiology and Biophysics.)

Director of School: Professor J. R. Larsen

School Office: 387 Morrill Hall, 505 South Goodwin, Urbana

LINGUISTICS

(Including Arabic, Hebrew, Hindi, Persian, and Swahili)

Chairperson of Department: Professor C-W. Kim

Department Office: 4088 Foreign Languages Building, 707 South Mathews, Urbana

Arabic

201. **Elementary Standard Arabic, I.** Mastery of the Arabic alphabet and phonetics; elementary formal grammar and the development of reading and writing skills; and conversation in the formal noncolloquial style. All students are required to register for one hour per week in the language laboratory. 5 hours.
202. **Elementary Standard Arabic, II.** Continuation of Arabic 201. All students are required to register for one hour per week in the language laboratory. Prerequisite: Arabic 201. 5 hours.
210. **Colloquial Arabic, I.** Development of conversational fluency in one of the major colloquial dialects; see Timetable for dialect to be taught each semester. 4 hours.
211. **Colloquial Arabic, II.** Continuation of Arabic 210. Prerequisite: Arabic 210. 4 hours.
303. **Intermediate Standard Arabic, I.** Survey of more advanced grammar; emphasis on increasing conversational fluency in the formal noncolloquial style; and reading of prose texts reflecting aspects of Arabic culture. All students are required to register

for one hour per week in the language laboratory. Prerequisite: Arabic 202. 5 hours or 1 unit.

- 304. **Intermediate Standard Arabic, II.** Continuation of Arabic 303. All students are required to register for one hour per week in the language laboratory. Prerequisite: Arabic 303. 5 hours or 1 unit.
- 305. **Advanced Standard Arabic, I.** Practice to attain conversational fluency in the formal noncolloquial style; introduction to Arabic literature; and readings in social, political, and historic writings. Prerequisite: Arabic 304. 5 hours or 1 unit.
- 306. **Advanced Standard Arabic, II.** Continuation of Arabic 305. Prerequisite: Arabic 305. 5 hours or 1 unit

Hebrew

- 201. **Elementary Modern Hebrew, I.** Introduction to Hebrew; includes conversation with a native speaker under the direction of a linguist-instructor, and a minimum of formal grammar and writing. Students are required to register for one hour weekly in the language laboratory. 5 hours.
- 202. **Elementary Modern Hebrew, II.** Continuation of Modern Hebrew 201, with introduction of more advanced grammar, and with emphasis on more fluency in speaking and reading. Prerequisite: Hebrew 201. 5 hours.
- 205. **Introduction to Classical Hebrew, I.** Same as Religious Studies 205. Stresses basic grammar of classical (biblical) Hebrew and acquisition of translation skills. 4 hours.
- 206. **Introduction to Classical Hebrew, II.** Same as Religious Studies 206. Stresses basic grammar of classical (biblical) Hebrew and acquisition of translation skills; translation of simple biblical prose. Prerequisite: Hebrew 205 or equivalent. 4 hours.
- 210. **Biblical Prose.** Same as Religious Studies 210. Reading and discussion of selections from the Books of Samuel with emphasis on grammar and exegesis; exercises in prose composition. Prerequisite: Hebrew 205 and 206. 4 hours.
- 303. **Intermediate Modern Hebrew, I.** First term of the second year of the Hebrew language, including drill for more advanced conversational fluency, increased study of the written language, and more formal grammar. All students in this course are required to register for one hour per week in the language laboratory. Prerequisite: Hebrew 202 or equivalent. 5 hours or 1 unit.
- 304. **Intermediate Modern Hebrew, II.** Concentration on ability to engage in reasonable fluent discourse in Hebrew, comprehensive knowledge of formal grammar, and an ability to read ordinary written Hebrew. All students in this course are required to register for one hour per week in the language laboratory. Prerequisite: Hebrew 303 or equivalent. 5 hours or 1 unit.
- 305. **Advanced Modern Hebrew, I.** Advanced spoken and written standard modern Hebrew; introduction to modern Hebrew literature. Prerequisite: Hebrew 305 or equivalent. 3 to 5 hours or 3/4 to 1 unit.
- 306. **Advanced Modern Hebrew, II.** A course for advanced knowledge of spoken and written standard Modern Hebrew with emphasis on Modern Hebrew literature and language. Prerequisite: Hebrew 305 or equivalent. 3 to 5 hours, or 3/4 to 1 unit.
- 307. **Topics in Modern Hebrew Language and Literature, I.** Selected readings from modern Hebrew authors, with emphasis on the novel and short story; lectures and discussions on Hebrew literature and aesthetics; and detailed analysis of formal Hebrew grammar. Prerequisite: Hebrew 306 or consent of instructor. 3 hours or 3/4 unit. May be repeated with consent of instructor.
- 308. **Topics in Modern Hebrew Language and Literature, II.** Selected readings from modern Hebrew authors, with special emphasis on the novel and short story; lectures and discussions on Hebrew literature and aesthetics; and detailed analysis of formal Hebrew grammar. Prerequisite: Hebrew 307 or consent of instructor. 3 hours or 3/4 unit. May be repeated with consent of instructor.
- 311. **Hebrew Poetry.** Same as Religious Studies 311. Translation and analysis of ancient Hebrew poetry, with emphasis on the development of Hebrew prosodic style

and on textual criticism; research paper required for graduate credit. Prerequisite: Hebrew 210 or equivalent. 4 hours or 1 unit

Hindi

201. **Elementary Hindi/Urdu, I.** An introduction to the Hindi/Urdu language; includes conversation with a native Hindi/Urdu-speaking tutor under the direction of a linguist instructor, and a minimum of formal grammar and Devanagari writing; introduction to Arabic-Persian script by arrangement. All students are required to register for one hour per week in the language laboratory. 5 hours.
202. **Elementary Hindi/Urdu, II.** Second term of spoken Hindi/Urdu; includes conversation with a native Hindi/Urdu-speaking tutor under the direction of a linguist instructor, formal grammar based on conversational materials, and work on written Hindi; concentration on written Urdu by arrangement. All students are required to register for one hour per week in the language laboratory. Prerequisite: Hindi 201. 5 hours.
301. **Intensive Hindi, I.** An intensive course on the Hindi language including conversation with a native Hindi-speaking tutor under the direction of a linguist-instructor; study of the formal grammar and the Devanagari script. 10 hours or 2 units.
302. **Intensive Hindi, II.** Includes drill for more advanced conversational fluency; introduction to a greater variety of styles and levels of discourse and usage; increasing study of the written language and more formal grammar; and concentration on ability to engage in reasonably fluent discourse in Hindi, on comprehensive knowledge of formal grammar, and on ability to read ordinary texts in Hindi. All students are required to register for one hour per week in the language laboratory. Prerequisite: Hindi 301 or equivalent, or consent of instructor. 10 hours or 2 units.
303. **Intermediate Hindi, I.** First term of second year of the Hindi language, including drill for more advanced conversational fluency; introduction to a greater variety of styles and levels of discourse and usage; and increasing study of the written language and more formal grammar. All students in this course are required to register for one hour per week in the language laboratory. Prerequisite: Hindi 202 or equivalent. 5 hours or 1 unit.
304. **Intermediate Hindi, II.** Concentration on ability to engage in reasonably fluent discourse in Hindi, on comprehensive knowledge of formal grammar, and on ability to read ordinary texts in Hindi. All students in this course are required to register for one hour per week in the language laboratory. Prerequisite: Hindi 303 or equivalent. 5 hours or 1 unit.
305. **Advanced Hindi, I.** A course for advanced knowledge of spoken and written Hindi. All students are required to work at least one hour each week with a native informant and/or in the language laboratory. Prerequisite: Hindi 304 or consent of instructor. 5 hours or 1 unit.
306. **Advanced Hindi, II.** A course for advanced knowledge of spoken and written Hindi with emphasis on modern Hindi literature and language. All students are required to work at least one hour each week with a native informant and/or in the language laboratory. Prerequisite: Hindi 305 or consent of instructor. 5 hours or 1 unit

Linguistics

191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Introduction to Language Science.** An introduction to the theory and methodology of general linguistics; includes the various branches and applications of linguistics. 3 hours.
201. **Elements of Phonology.** Introduction to the formal description of phonological structure, including study of articulatory phonetics, the phonological feature framework, and fundamental concepts of generative phonological theory. Prerequisite: Credit or concurrent registration in Linguistics 200, or consent of instructor. 3 hours.
202. **Elements of Syntax.** Introduction to the types of syntactic and semantic phenomena found in natural language, with material drawn from a variety of languages; emphasis on the implications of such phenomena for linguistic theory; formalism and application of generative grammar. Prerequisite: Credit or concurrent registration in Linguistics 200, or consent of instructor. 3 hours.
225. **Elements of Psycholinguistics.** Introduction to the theory and methodology of psycholinguistics with emphasis on language acquisition and linguistic behavior. 3 hours.
290. **Individual Study.** Individual readings and research reports on special topics dealing with the theoretical or applied aspects of the linguistic sciences. Prerequisite: Written consent of instructor on form available in linguistics departmental office. 2 to 4 hours. May be repeated to a maximum of 8 hours.
291. **Honors Individual Study.** Study and research for honors thesis; open only to seniors in the linguistics field of concentration who are eligible for departmental distinction. Prerequisite: Written consent of instructor on form available in linguistics departmental office; linguistics course average of 4.4. 2 to 4 hours. May be repeated to a maximum of 8 hours.
300. **Introduction to Linguistic Structure.** Same as Anthropology 300. Introduction to the theory and methodology of the science of linguistics with special reference to phonology and syntax. 3 hours or 1/2 unit.
301. **Introduction to General Phonetics.** Introduction to the main branches of general phonetics and phonological theory; emphasis on analysis of non-Western languages and research techniques. 3 hours or 1/2 unit.
302. **Introduction to Language History.** Introduction to the nature of language change; includes sound change, change through language contact (such as Pidgins and Creoles), semantic change (etymology), language relationship and reconstruction, and language history as an aid to understanding cultural history (philology). This course cannot be used to fulfill departmental graduate requirements. Prerequisite: Four years of high school foreign language study or fulfillment of the College of Liberal Arts and Sciences foreign language requirement. 3 hours or 1/2 unit.
303. **Non-Western Linguistic Structures.** Intensive study of linguistic structure of a selected non-Western language. 3 hours or 1 unit. May be repeated for credit with consent of instructor.
304. **Tutorials in Nonwestern Languages.** Advanced or intensive language instruction in a selected nonwestern language; does not cover instruction in East or Southeast Asian languages. Prerequisite: Consent of instructor. 1 to 5 hours, or 1/2 to 1 unit. May be repeated with consent of instructor.
305. **Introduction to Applied Linguistics.** Same as English as a Second Language 305. Introduction to the applications of general linguistic theory to the specific fields of stylistics, theory of translation, contrastive analyses, and the teaching and learning of foreign and second languages; practical assignment work. Prerequisite: Consent of instructor. 3 hours, or 1/2 or 1 unit.
306. **Introduction to Computational Linguistics.** Introduction to the use of computers in grammatical rule testing, computer-assisted language instruction, experimental phonetics, historical and comparative linguistics, quantitative study of language, and stylistic analysis; includes SNOBOL programming language, PLATO, dialectology, and automatic translation. Prerequisite: Linguistics 300 and Computer Science 106, or consent of instructor. 3 hours or 1 unit.

307. **Introduction to Mathematical Linguistics.** Same as Anthropology 307. Principles of set theory, logic and formal systems, group theory, and automata theory; introduction to the formal theory of grammars. Prerequisite: Linguistics 300. 3 hours or 1 unit.
309. **Introduction to Indo-European Linguistics.** Same as Greek 310 and Latin 310. Introductory survey of Indo-European languages and their mutual relations; exemplification of methods of reconstruction; principles of comparative phonology and introductory survey of morphology; and discussion of theories about the original home, culture, and society of the Indo- Europeans. Prerequisite: Fulfillment of the language requirement of the College of Liberal Arts and Sciences. 3 hours or 1 unit.
312. **Stylistics and Literary Criticism.** Same as English 304. See English 304.
314. **Introductory Coptic, I.** Same as Coptic and Religious Studies 301. See Coptic 301.
315. **Introductory Coptic, II.** Same as Coptic and Religious Studies 302. See Coptic 302.
316. **Structure of the French Language.** Same as French 316. See French 316.
320. **Introduction to African Linguistics.** Introduction to genetic and typological classification of the main language families of Africa; concentration on grammatical and phonological characteristics. Prerequisite: Linguistics 200 or 300; consent of instructor. 3 hours or 1 unit.
323. **Language Acquisition.** Same as Communications 323 and Psychology 323. See Psychology 323.
325. **Introduction to Psycholinguistics.** Same as Communications 325. Introductory survey of psychological and linguistic approaches to the study of communication. Credit is not given for both Psychology 325 and Linguistics 325. Prerequisite: Credit or concurrent registration in Linguistics 300. 3 hours or 1 unit.
330. **Introduction to Far Eastern Linguistics.** Same as Chinese, Japanese, and Korean 330. Introduction to genetic relation of the Far Eastern languages with other languages; concentration on synchronic analysis of phonology and syntax. Prerequisite: Linguistics 300; consent of instructor. 3 hours or 1 unit.
332. **Sex-related Differences in Language.** Same as Speech Communication 332. See Speech Communication 332.
338. **Philosophies of Language.** Same as Philosophy 338. See Philosophy 338.
340. **History of Linguistics.** Survey of linguistic theories from ancient to modern times; special emphasis on comparative grammar and the development of structural linguistics; and extended discussion of at least one other period. 3 hours or 1 unit.
350. **Introduction to Sociolinguistics.** Same as English as a Second Language 350. Critical study of the sociologically oriented general linguistic theories; special reference to language varieties, language attitudes, language diversity, language standardization, linguistic geography, and language and political roles (language loyalty); emphasis on research methodology and techniques. Prerequisite: Introductory course in linguistics or consent of instructor. 3 hours, or 1/2 or 1 unit.
353. **Spanish Structure.** Same as Spanish 353. See Spanish 353.
360. **Introduction to South Asian Linguistics.** Introduction to genetic and typological classification of the main language families of South Asia; concentration on phonology or syntax. Topics vary. 3 hours or 1 unit. May be repeated to a maximum of 6 hours or 2 units with consent of instructor.
362. **Introduction to Romance Linguistics.** Same as French, Italian, Portuguese, Romance Linguistics, and Spanish 362. See Spanish 362.
367. **Introduction to Germanic Linguistics.** Same as Germanic 367. See Germanic 367.
370. **Language, Culture, and Society.** Same as Anthropology 370 and Communications 370. See Anthropology 370.
375. **Speech Science, I.** Same as Speech and Hearing Science and Speech Communication 375. See Speech and Hearing Science 375.
376. **Speech Science, II.** Same as Speech and Hearing Science and Speech Communication 376. See Speech and Hearing Science 376.
380. **Introduction to Slavic Linguistics.** Same as Slavic 380. See Slavic 380.

382. **Introduction to Sanskrit Linguistics.** A linguistic introduction to the structure of Sanskrit (phonetics, phonology, and morphology) and its historical antecedents and development, with reading of sample texts. Prerequisite: Linguistics 300 and consent of instructor. 3 hours or 1 unit.
386. **Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as a Second Language, French, German, Humanities, Slavic, and Spanish 382. See Humanities 382.
387. **The Structure of English.** Critical evaluation of traditional and structuralist grammatical descriptions; introduction to transformational grammatical studies; detailed survey of a transformational syntax of English; and brief introduction to generative phonology and morphophonemic analysis of English, especially stress. 3 hours or 3/4 unit.
388. **English Phonology and Morphology for ESL Teachers.** Same as English as a Second Language 388. See English as a Second Language 388.
389. **Theoretical Foundations of TESL Methodology.** Same as English as a Second Language 389. See English as a Second Language 389.
400. **Introduction to General Linguistics.** Same as Anthropology 400 and English as a Second Language 402. Introduction to the linguistic sciences; linguistic theory and methodology; and branches of linguistics and their application. 1 unit. Credit may not be applied toward a graduate degree in linguistics.
401. **Syntax.** Critique of traditional and contemporary theories of syntactic structure; systematic introduction to transformational grammar. Prerequisite: Linguistics 300 or equivalent. 1 unit.
402. **Phonology.** Examination of language-specific phonological problems with a view toward formulating a language-independent theory of phonology. Prerequisite: Linguistics 301 or consent of instructor. 1 unit.
403. **Seminar in Linguistic Analysis.** Discussion of advanced topics of current interest in descriptive linguistics. Prerequisite: Linguistics 401. 1 unit. May be repeated for credit with consent of instructor.
404. **Practicum.** Classroom- and*homework-solving of assorted problems in syntactic and phonological analysis of many languages. Prerequisite: Linguistics 401 and 402. 1 unit. May be repeated for credit as topic varies with consent of instructor.
405. **Seminar in Stylistics.** Same as Comparative Literature 405. Seminar designed to evaluate and discuss earlier and current linguistically motivated stylistic theories; emphasis on the theoretical and methodological problems in application of linguistics to stylistic analysis of literary texts. Prerequisite: Linguistics 300 or 305; consent of instructor. 1 unit.
408. **Russian Phonology.** Same as Russian 408. See Russian 408.
411. **Historical Linguistics.** Introduction to historical and comparative linguistics with particular attention to theoretical issues. Prerequisite: Credit or registration in Linguistics 300 and 301. 1 unit.
412. **Research Seminar in Historical Linguistics.** Research work in etymology, linguistic geography, and historical syntax. Prerequisite: Linguistics 411 or consent of instructor. 1 unit.
419. **Contrastive Linguistics.** Same as English as a Second Language 419. Critical survey of contemporary linguistic models; special reference to their relevance in preparing comparative analyses of languages; and detailed discussion on contrastive analysis of English and selected non-Western languages at different linguistic levels. Prerequisite: Linguistics 300 or consent of instructor. 1/2 or 1 unit.
420. **Linguistic Phonetics.** Principles of scientific description of the phonic aspect of language; distinctive features and phonetic alphabets; relations between phonetics and other linguistic levels; and inventory of speech sounds. Prerequisite: Linguistics 301 or equivalent. 1 unit.
421. **Seminar in Phonetic Theories.** Theories of speech production; motor theory and linguistic change; acoustical correlates of vocal-tract configurations; theories of speech perception; and a model of universal phonetics. Prerequisite: Linguistics 301 or equivalent. 1 unit.

- 424. Developmental Psycholinguistics.** Same as Communications and Psychology 424. See Psychology 424.
- 425. Psycholinguistics.** Same as Communications 425 and Psychology 425. See Psychology 425.
- 426. Psycholinguistics.** Same as Communications 426 and Psychology 426. See Psychology 426.
- 429. Second Language Acquisition and Bilingualism.** Same as Psychology 429. Examination of the field from a psycholinguistic perspective; topics discussed include first versus second language acquisition; the nature of language aptitude and competence; methods of second language teaching; the nature of bilingualism; and comparative psycholinguistics. Prerequisite: Consent of instructor. 1 unit.
- 440. Seminar in History of Linguistics.** Analysis of recent theoretical approaches. Prerequisite: Linguistics 340. 1 unit.
- 441. Syntax, II.** Advanced analysis and critique of syntactic descriptions, with special attention to implications for universal grammar. Prerequisite: Linguistics 401 or consent of instructor. 1 unit.
- 442. Phonology, II.** Continuation of Linguistics 402. Prerequisite: Linguistics 402. 1 unit.
- 450. Linguistics and the Study of Meaning.** Consideration of those aspects of meaning which are the concern of linguistic theory. Prerequisite: Linguistics 300. 1 unit.
- 460. Seminar in Bilingualism.** A research-oriented seminar on theoretical and applied aspects of bilingualism; critical evaluation of linguistic, neurolinguistic, sociolinguistic, and psycholinguistic approaches to bilingualism; and concentration on selected case studies from western and nonwestern societies, especially Asia and Africa. Prerequisite: Linguistics 350 or an introductory course in linguistics. 1 unit.
- 462. Seminar in Romance Linguistics.** Same as French, Italian, Portuguese, Romance Linguistics, and Spanish 462. See Spanish 462.
- 475. Experimental Phonetics, I.** Same as Speech and Hearing Science 475. See Speech and Hearing Science 475.
- 476. Experimental Phonetics, II.** Same as Speech and Hearing Science 476. See Speech and Hearing Science 476.
- 481. Topics in Syntactic Theory.** Investigation of syntactic universals; recent developments in the theory of syntax. Prerequisite: Linguistics 441 or consent of instructor. 1 unit. May be repeated as topics vary with consent of instructor.
- 482. Topics in Phonological Theory.** Recent developments in the theory of phonology. Prerequisite: Linguistics 442 or consent of instructor. 1 unit. May be repeated for credit as topic varies with consent of instructor.
- 490. Special Topics in Linguistics.** Individual studies in the areas of linguistics not covered by regular course offerings. 1/2 to 2 units.
- 499. Thesis Research.** 0 to 4 units

Persian

- 201. Elementary Persian, I.** Introduction to Persian, including conversation with a native speaker under the direction of a linguist-instructor, and a minimum of formal grammar and writing. 5 hours.
- 202. Elementary Persian, II.** Continuation of Persian 201, with introduction of more advanced grammar and with emphasis on more fluency in speaking and reading. Prerequisite: Persian 201 or equivalent. 5 hours.
- 205. Introduction to Persian Culture and Literature, I.** Same as Comparative Literature 203. A survey of Persian civilization with emphasis on Persian literary and aesthetic expression. Knowledge of Persian is not required. 3 hours.
- 206. Introduction to Persian Culture and Literature, II.** Same as Comparative Literature 204. Continuation of Persian 205/ Comparative Literature 203. A survey of Persian civilization with emphasis on Persian literary and aesthetic expression. Knowledge of Persian is not required. 3 hours.

303. **Intermediate Persian, I.** A general review of the essentials of grammar, selected reading of materials emphasizing Iranian life and culture, compositions, and practice in speech. Prerequisite: Persian 202. 5 hours or 1 unit.
304. **Intermediate Persian, II.** A general review of the essentials of grammar, selected reading of materials emphasizing Iranian life and culture, compositions, and practice in speech. Prerequisite: Persian 303. 5 hours or 1 unit.
305. **Advanced Persian, I.** Designed to improve competence in speaking, writing, and reading Persian; includes reading in modern and classical Persian prose and poetry. Prerequisite: Persian 304. 3 hours or 1 unit.
306. **Advanced Persian, II.** Continuation of Persian 305. Designed to improve competence in speaking, writing, and reading Persian; includes reading in modern and classical Persian prose and poetry. Prerequisite: Persian 305. 3 hours or 1 unit

Swahili

201. **Elementary Swahili, I.** Same as African Studies 201. Beginning spoken Swahili with minimum of formal grammar; conversation with a native Swahili tutor under the supervision of a linguist-instructor. 5 hours.
202. **Elementary Swahili, II.** Same as African Studies 202. Second semester of spoken Swahili; more conversation with a native tutor; and further grammar. Prerequisite: Swahili 201. 5 hours.
303. **Intermediate Swahili, I.** Same as African Studies 303. Second-year Swahili with emphasis on developing conversational fluency; some readings on Swahili culture and customs. Prerequisite: One year of Swahili. 5 hours or 1 unit.
304. **Intermediate Swahili, II.** Same as African Studies 304. More of second-year Swahili with emphasis on conversational fluency; some readings in Swahili literature. Prerequisite: One year of Swahili. 5 hours or 1 unit.
305. **Advanced Swahili, I.** Same as African Studies 305. Third- year Swahili with emphasis on conversational fluency and on increased facility in reading Swahili texts, including current newspaper prose and (East) African culture materials. Prerequisite: Swahili 304 or equivalent. 5 hours or 1 unit.
306. **Advanced Swahili, II.** Same as African Studies 306. Third- year Swahili with emphasis on conversational fluency and on increased facility in reading Swahili texts, including current newspaper prose and (East) African culture materials. Prerequisite: Swahili 305 or equivalent. 5 hours or 1 unit

MATHEMATICS

Head of Department: Professor Heini Halberstam

Department Office: 273 Altgeld Hall, 1409 W. Green, Urbana

101. **Basic Mathematics.** Introduction to algebra, designed for the Educational Opportunities Program; topics in arithmetic, measurement, and elementary geometry and algebra. 4 hours.
104. **Elements of Algebra and Trigonometry.** For premedical students and students in the curriculum preparatory to the teaching of biology who have entered with only one unit of high school algebra and who need credit in trigonometry as a prerequisite to physics. Students who enter with one and one- half units of algebra must take Mathematics 114. Credit in Mathematics 104 involves duplication of credit with Mathematics 111, 114, and 118, and does not serve as a prerequisite for Mathematics 120. Prerequisite: High school algebra, one unit; high school plane geometry, one unit. 3 hours. Credit is not given for both Mathematics 104 and 116.
111. **Algebra.** Examines the real number system: factoring, powers and roots, rational expressions, equations and inequalities, the quadratic formula; functions and graphs;

- exponential and logarithm functions; systems of equations; matrices and determinants; polynomials; the binomial theorem. An accelerated treatment of college algebra is given in Mathematics 112. Prerequisite: 1 unit of high school algebra, and 1 unit of high school geometry. 5 hours. Credit is not given for both Mathematics 111 and either 112 or 116.
112. **College Algebra.** Rapid review of basic techniques of factoring, rational expressions, equations and inequalities; functions and graphs; exponential and logarithm functions; systems of equations; matrices and determinants; polynomials; and the binomial theorem. Students who need both algebra and trigonometry should enroll in Mathematics 116. Prerequisite: 1 1/2 units of high school algebra, and 1 unit of high school geometry. 3 hours. Credit is not given for both Mathematics 112 and either 111 or 116.
114. **Plane Trigonometry.** Studies degrees and radians, the trigonometric functions, identities and equations, inverse functions, oblique triangles and applications. Students who need both algebra and trigonometry should enroll in Mathematics 116. Prerequisite: 1 1/2 units of high school algebra, or concurrent registration in Mathematics 111 or 112; 1 unit of high school geometry. 2 hours. Credit is not given for both Mathematics 114 and 116.
116. **College Algebra and Trigonometry.** A unified treatment of algebra and trigonometry that combines Mathematics 112 and 114. Students who need Mathematics 112 and 114 should enroll in Mathematics 116. Prerequisite: 1 1/2 units of high school algebra; 1 unit of high school geometry. 5 hours.
118. **Introduction to Mathematics, I.** An elementary course for students whose major interests are not in engineering or the physical sciences; provides an overall view of mathematics; emphasizes ideas and concepts rather than routine drill; and includes concepts from the following areas: combinatorics, number theory, the real and rational number systems, topology, representation of numbers, and map coloring. Prerequisite: High school algebra, one unit; high school plane geometry, one unit; or equivalent. 3 hours.
119. **Introduction to Mathematics, II.** Continuation of Mathematics 118; includes concepts from the following areas: combinatorics, algebraic number theory, constructions, cardinal numbers, probability and statistics, analytic geometry, and calculus. Prerequisite: Mathematics 118. 3 hours.
120. **Calculus and Analytic Geometry, I.** First course in calculus and analytic geometry; basic techniques of differentiation and integration with applications, including curve tracing in the plane. Students with strong backgrounds in analytic geometry should normally enroll in Mathematics 135. Prerequisite: Mathematics 111 or 112, and Mathematics 114, or an adequate mathematics placement test score. 5 hours. Credit is not granted for Mathematics 120 and Mathematics 134 or 135.
124. **Finite Mathematics.** An introduction to finite mathematics for students in the social sciences; introduces the student to the basic ideas of logic, set theory, probability, vectors and matrices, and Markov chains. Problems are selected from social sciences and business. Prerequisite: Mathematics 111 or 112, or an adequate mathematics placement test score. 3 hours.
125. **Elementary Linear Algebra with Applications.** Basic concepts and techniques of linear algebra; includes systems of linear equations, matrices, determinants, vectors in n -space, and eigenvectors, together with selected applications, such as Markov processes, linear programming, economic models, least squares, and population growth. Prerequisite: Mathematics 111 or 112, or an adequate placement test score. 3 hours.
130. **Calculus and Analytic Geometry, II.** Second course in calculus and analytic geometry; methods of integration, conic sections, polar coordinates, vectors and parametric equations, and infinite series. Prerequisite: Mathematics 120. 5 hours. Students with credit in Mathematics 131 receive 2 hours credit for Mathematics 130.
131. **Calculus and Analytic Geometry, II.** Second course in calculus and analytic geometry. Methods of integration; conic sections; polar coordinates; and vectors.

- Prerequisite: Mathematics 120. 3 hours. Students with credit in Mathematics 130 may not receive credit for Mathematics 131.
134. **Calculus for Social Scientists, I.** Introduction to the concept of functions and the basic ideas of the calculus. Prerequisite: Mathematics 111 or 112. 4 hours. Credit is not granted for Mathematics 134 and Mathematics 120 or 135.
135. **Calculus.** First course in calculus. Differentiation and integration; applications to curve-tracing, maxima and minima, area, and volume. Prerequisite: Completion of a thorough course in plane and solid analytic geometry, or equivalent. 5 hours. Credit is not given for both Mathematics 135 and 120.
149. **Honors Course in Mathematics.** Prerequisite: Concurrent registration in an honors section of Mathematics 120, 130, 131, 240, or 241; consent of the department. Enrollment is strictly limited to students with superior mathematical talents. 1 hour.
161. **Statistics.** A first course in probability and statistics at a precalculus level; emphasizes basic concepts, including descriptive statistics, elementary probability, estimation, and hypothesis testing in both nonparametric and normal models. Prerequisite: Mathematics 111 or 112. 3 hours. Credit is not given for both Mathematics 161 and Economics 171 or 172 or Psychology 233.
198. **Freshman Seminar.** Guides the student in the study of selected topics not considered in standard courses. Prerequisite: Enrollment in the mathematics honors program; consent of department. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
202. **Mathematics for Elementary Teachers.** A systematic presentation of elementary mathematics for juniors and seniors who are preparing to teach in elementary schools. Topics include decimal numerals, number systems, sets, and introductory algebra. A simultaneous development of teaching methods and materials may be included. Not acceptable for credit in the College of Liberal Arts and Sciences. Prerequisite: Junior standing in elementary education. 5 hours.
203. **Mathematics for Elementary Teachers.** Continuation of Mathematics 202. Topics include measurement, metric and nonmetric geometry, algebra, sets, and introduction to trigonometry, statistics, and probability. A simultaneous development of teaching methods and materials is also included. Not acceptable for credit in the College of Liberal Arts and Sciences. Prerequisite: Mathematics 202 or consent of instructor. 3 hours.
240. **Calculus of Several Variables.** Third course in calculus and analytic geometry; functions of several variables, partial derivatives, and multiple integrals. Prerequisite: Mathematics 130. 3 hours. Students may not receive credit for both Mathematics 240 and Mathematics 241, 244, or 245.
241. **Calculus of Several Variables.** Third course in calculus and analytic geometry; infinite series, vectors and geometry in three dimensional space, functions of several variables, partial derivatives, and multiple integrals. Prerequisite: Mathematics 131. 5 hours. Students may not receive credit for both Mathematics 241 and Mathematics 240, 244, or 245. Students with credit in Mathematics 130 receive 3 hours credit for Mathematics 241.
244. **Calculus for Social Scientists, II.** Continuation of Mathematics 134. The calculus of the trigonometric functions, Taylor polynomials, and infinite series; analytic geometry in n dimensions, vector calculus, classical extremum problems in n variables, and Lagrange multipliers; and multiple integrals. Prerequisite: Mathematics 134 or consent of instructor. 5 hours. Students may not receive credit for Mathematics 244 and Mathematics 240, 241, or 245.
245. **Calculus, II.** Continuation of Mathematics 135. Polar coordinates, vectors and parametric equations, infinite series, functions of several variables, partial derivatives, and multiple integrals. Prerequisite: Mathematics 135. 5 hours. Students may not receive credit for both Mathematics 245 and Mathematics 240, 241, or 244.
250. **Advanced Problem Solving.** The art and technique of solving mathematical problems. Prerequisite: The calculus. 1 hour. May be repeated to a maximum of 6 hours.
257. **Numerical Methods.** Same as Computer Science 257. See Computer Science 257.

- 263. Statistics for Scientists.** A first course in the use of statistical methodology for the interpretation and analysis of data arising from scientific investigations; directed toward a general audience of students in physical, biological, social, or engineering sciences; and prepares the student for the sequel course, Mathematics 369. Prerequisite: Mathematics 240, 241, 244, or 245, or equivalent. 3 hours.
- 270. Actuarial Problem Solving.** Methods and techniques of solving problems in actuarial mathematics for advanced students intending to enter the actuarial profession. Prerequisite: Consent of instructor. 1 to 2 hours. May be repeated to a maximum of 4 hours.
- 290. Individual Study.** Guided individual study of advanced topics not covered in other courses. Prerequisite: Mathematics 347 with grade of B or better, or consent of department. 2 hours. May be repeated to a maximum of 8 hours.
- 291. Honors Individual Study.** Guided individual study of advanced topics not covered in other courses; for students seeking honors credit. Prerequisite: Mathematics 347 with grade of B or better, or consent of Mathematics Honors Committee. 2 hours. May be repeated to a maximum of 8 hours.
- 294. Computational Laboratory.** Guided individual study of numerical aspects of topics in mathematics; may be taken in conjunction with other mathematics courses with instructor's approval. Prerequisite: Consent of instructor. 1 hour. May be repeated to a maximum of 3 hours.
- 296. Honors Seminar.** Careful study of a selected area of mathematics, carried out either deductively from axioms or inductively through problems; subject matter varies with instructor. Prerequisite: Consent of Mathematics Honors Committee. 3 hours. May be repeated to a maximum of 6 hours.
- 302. Topics on Geometry.** Historical development of geometry; includes tacit assumptions made by Euclid, Euclid's Fifth Postulate and its equivalents; the discovery of non-Euclidean geometries; geometry as a mathematical structure; and geometry as a study of invariants of set transformations. Prerequisite: Mathematics 240, 241, or 245, or equivalent, or consent of instructor. 3 hours or 1 unit.
- 303. Advanced Aspects of Euclidean Geometry.** Selected topics from geometry, for example circumcircle, the nine-point circle, theorems on centroid and ortho-center, the construction of regular figures, isometries in the plane and space, rotations and translations, fixed points, ordered and affine geometries, and geometry of inversive plane. Prerequisite: Mathematics 240, 241, or 245, or equivalent, or consent of instructor. 3 hours or 1 unit.
- 305. Teacher's Course.** Presents selected topics in mathematics that are related to the content of secondary school mathematics programs; provides background for enrichment topics for secondary school students; and may include, among others, the following topics: number systems, mathematical induction, number theory, probability, graph theory, Boolean algebras and their relation to computer design, ruler and compass constructions, and the geometry of complex numbers. Prerequisite: Mathematics 240, 241, or 245, or consent of instructor. 3 hours, or 1/2 or 1 unit.
- 306. History of Calculus.** An examination of the historical origins and genesis of the concepts of the calculus; includes mathematical developments from the ancient Greeks to the eighteenth century. Prerequisite: Mathematics 240, 241, or 245, or equivalent. 3 hours or 1 unit.
- 310. Theory of Interest.** A study of compound interest and annuities; applications to problems in finance. Prerequisite: Mathematics 240, 241, or 245. 3 hours or 1 unit.
- 311. Advanced Algebra.** Algebraic methods of summation of infinite series; primarily intended for students interested in actuarial science, but not restricted to such students. Prerequisite: Mathematics 240, 241, or 245, or equivalent, or consent of instructor. 3 hours or 1 unit.
- 313. Combinatorial Mathematics.** Same as Computer Science 313. Permutations and combinations, generating functions, recurrence relations, inclusion and exclusion, Polya's theory of counting, and block designs. Prerequisite: Mathematics 240, 241, or 245, or equivalent. 3 hours or 1 unit.

314. **Introduction to Mathematical Logic.** Introduction to the formalization of mathematics and the study of axiomatic systems; detailed treatment of the propositional calculus and the first-order predicate calculus; and Godel's completeness and compactness theorems with applications to specific mathematical theories. Prerequisite: Mathematics 240, 241, or 245, or consent of instructor. 3 hours or 1 unit.
315. **Linear Transformations and Matrices.** An introductory course emphasizing techniques of linear algebra; topics include matrix operations, determinants, linear equations, vector spaces, linear transformations, eigenvalues, and eigenvectors. Prerequisite: Mathematics 240, 241, or 245, or equivalent. 3 hours or 1 unit.
317. **Introduction to Abstract Algebra.** An introductory course in abstract algebra; includes modular arithmetic, permutations, group theory through the isomorphism theorems, ring theory through the notions of prime and maximal ideals, and additional topics such as unique factorization domains and classification of groups of small order. Prerequisite: Mathematics 240, 241, or 245, or equivalent. 3 hours or 1 unit.
318. **Introduction to Linear Algebra.** Abstract approach emphasizing concept of linear transformation; topics include linear equations, vector spaces, linear transformation, matrices, determinants, invariant subspaces, direct sum decompositions, canonical forms, inner product spaces, and bilinear forms. Prerequisite: Junior standing and one course beyond calculus, or consent of instructor. 3 hours or 1 unit.
319. **Applied Modern Algebra.** Same as Electrical Engineering 319. Sets and functions, finite-state machines, partially ordered sets, Boolean algebras, normal form of switching functions, the semigroup of a machine, and group codes. Prerequisite: Mathematics 240, 241, or 245, or equivalent. 3 hours or 1 unit.
323. **The Calculus of Curves and Surfaces.** Applications of the calculus to the study of shape and curvature of curves and surfaces; introduction to vector fields, differential forms on Euclidean spaces, and the method of moving frames for low-dimensional differential geometry. Prerequisite: Mathematics 240, 241, or 245; or equivalent. 3 hours or 1 unit.
332. **Introduction to Set Theory and Topology.** Informal set theory, cardinal and ordinal numbers, and axiom of choice; topology of metric spaces and introduction to general topological spaces. Prerequisite: Credit or concurrent registration in Mathematics 347. 3 hours or 1 unit.
339. **Philosophy of Mathematics.** Same as Philosophy 339. See Philosophy 339.
340. **Differential Equations with Linear Algebra.** An introduction to elementary linear algebra and ordinary linear differential equations; considers both single differential equations and systems of differential equations, with applications. Prerequisite: Mathematics 240, 241, or 245, or equivalent. 3 hours or 1 unit. Credit is not given for both Mathematics 340 and either of Mathematics 341 or 345.
341. **Differential Equations.** A basic course in ordinary differential equations; topics include existence and uniqueness of solutions and the general theory of linear differential equations; treatment is more rigorous than that given in Mathematics 345. Prerequisite: Mathematics 240, 241, or 245, or equivalent. 3 hours or 1 unit. Credit is not given for both Mathematics 341 and either 340 or 345.
342. **Fourier Series and Boundary Value Problems.** Deals with the theory of Fourier series and applications to solving partial differential equations. Prerequisite: Mathematics 340, 341 or 345. 3 hours or 1 unit.
343. **Advanced Calculus.** Introductory study of vector calculus and functions of several variables; topics include directional derivatives; Jacobians; change of variables in multiple integrals; maxima and minima; line and surface integrals; theorems of Gauss, Green, and Stokes; infinite series; and uniform convergence. Prerequisite: Mathematics 240, 241, or 245, or equivalent. 3 hours or 1 unit.
344. **Elementary Real Analysis.** Careful treatment of the theoretical aspects of the calculus of functions of a real variable; topics include the real number system, limits, continuity, derivatives, and the Riemann integral. Prerequisite: Mathematics 240, 241, or 245. 3 hours or 1 unit. Credit is not given for both Mathematics 344 and 347.

- 345. Differential Equations and Orthogonal Functions.** Intended for engineering students and others who require a working knowledge of differential equations; included are techniques and applications of ordinary differential equations and an introduction to partial differential equations. Prerequisite: Mathematics 240, 241, or 245, or equivalent. 3 hours or 1 unit. Credit is not given for Mathematics 345 and either 340 or 341.
- 346. Complex Variables and Applications.** For students who desire a working knowledge of complex variables; covers the standard topics and gives an introduction to integration by residues, the argument principle, conformal maps, Laplace transforms, and potential fields. Students desiring a systematic development of the foundations of the subject should take Mathematics 348. Prerequisite: Mathematics 343 or consent of instructor. 3 hours or 1 unit. Credit is not given for both Mathematics 346 and 348.
- 347. Introduction to Higher Analysis: Real Variables.** Careful development of elementary real analysis including such topics as completeness property of the real number system; basic topological properties of n -dimensional space; convergence of numerical sequences and series of functions; properties of continuous functions; and basic theorems concerning differentiation and Riemann integration. Prerequisite: Mathematics 240, 241, or 245 (or equivalent) and junior standing; or consent of instructor. 3 hours or 1 unit. Credit is not given for both Mathematics 344 and 347.
- 348. Introduction to Higher Analysis: Complex Variables.** For students who desire a rigorous introduction to the theory of functions of a complex variable; topics include Cauchy's theorem, the residue theorem, the maximum modulus theorem, Laurent series, the fundamental theorem of algebra, and the argument principle. Prerequisite: Mathematics 347. 3 hours or 1 unit. Credit is not given for both Mathematics 346 and 348.
- 351. Topics in Applied Mathematics.** Deals with topics in the application of mathematics to the physical, biological, and social sciences; see Timetable or department office for current topics. Prerequisite: Consent of instructor. 3 hours or 1 unit. May be repeated with consent of instructor.
- 352. Multivariate Real Analysis.** Rigorous treatment of the calculus of functions of several real variables; topics covered include differentials, maxima and minima, Lagrange multipliers, transformation of multiple integrals, Jacobian's, implicit function theorems, line and surface integrals, Stokes' theorem, and vector analysis. Prerequisite: Mathematics 347. 3 hours or 1 unit.
- 353. Elementary Theory of Numbers.** Topics covered include divisibility, primes, congruences, quadratic reciprocity, and Farey sequences. The course objectives are to familiarize students with mathematical proofs and to prepare them for further work in algebra and number theory. Prerequisite: Mathematics 240, 241, or 245, or equivalent. 3 hours or 1 unit.
- 354. Theory of Algebraic Numbers.** Topics include Gaussian integers and primes, polynomials, divisibility, algebraic integers, arithmetic in algebraic number fields, ideals, class numbers, and units. Prerequisite: Mathematics 317 or 353. 3 hours or 1 unit.
- 355. Numerical Methods for Partial Differential Equations.** Same as Computer Science 355. See Computer Science 355.
- 357. Mathematical Models in the Social Sciences.** Use of many models drawn from the social sciences to motivate, illustrate, and give a unified development of topics in one or more of the following areas: linear algebra, graph theory, Markov chains, linear and nonlinear systems of difference equations, and optimization. Prerequisite: Mathematics 134 or equivalent. 3 hours or 1 unit.
- 358. Numerical Analysis: Linear Problems.** Same as Computer Science 358. See Computer Science 358.
- 359. Numerical Analysis: Nonlinear Problems.** Same as Computer Science 359. See Computer Science 359.
- 361. Introduction to Probability Theory, I.** Introduction to mathematical probability; includes the calculus of probability, combinatorial analysis, random variables,

- expectation, distribution functions, moment-generating functions, and central limit theorem. Prepares students for Mathematics 362 and 366. Prerequisite: Mathematics 240, 241, or 245, or equivalent. 3 hours or 1 unit.
362. **Introduction to Mathematical Statistics.** Introduction to mathematical statistics assuming only knowledge of probability theory; includes normal sampling theory, sufficiency, best estimators, maximum likelihood estimators, confidence intervals, most powerful tests, and chi-square tests. Prerequisite: Mathematics 361. 3 hours or 1 unit. Credit is not given for both Mathematics 362 and 364.
363. **Introduction to Mathematical Statistics and Probability, I.** Introduction to mathematical statistics that develops probability as needed; includes the calculus of probability, random variables, expectation, distribution functions, central limit theorem, point estimation, confidence intervals, and hypothesis testing. Prepares students for Mathematics 364. Prerequisite: Mathematics 240, 241, or 245, or equivalent. 3 hours or 1 unit.
364. **Introduction to Mathematical Statistics and Probability, II.** Continuation of Mathematics 363. Includes moment-generating functions, transformations of random variables, normal sampling theory, sufficiency, best estimators, maximum likelihood estimators, confidence intervals, most powerful tests, unbiased tests, and chi-square tests. Prerequisite: Mathematics 363. 3 hours or 1 unit. Credit is not given for both Mathematics 364 and 362.
365. **Analysis of Variance.** Estimation and hypotheses testing in linear models; one-, two-, and higher-way layouts; incomplete layouts; analysis of covariance; and random effects models and mixed models. Prerequisite: Credit or concurrent registration in Mathematics 315 and 362 or 364. 3 hours or 1 unit.
366. **Introduction to Probability Theory, II.** Continuation of Mathematics 361. Includes random walks, discrete and continuous time Markov chains, and special topics selected from weak stationarity, multivariate central limit theorem, probability model building, stochastic equations, martingale theory, and renewal theory. Prerequisite: Mathematics 361 or 364. 3 hours or 1 unit.
368. **Topics in Applied Statistics.** Formulation and analysis of mathematical models for random phenomena; extensive involvement with the analysis of real data; and instruction in statistical and computing techniques as needed. Prerequisite: Mathematics 362, 364, or 369, or consent of instructor. 3 hours or 1 unit. May be taken for credit more than once with consent of instructor.
369. **Methods of Applied Statistics.** Systematic, calculus-based coverage of the more widely used methods of applied statistics, including simple and multiple regression, correlation, analysis of variance and covariance, multiple comparisons, goodness of fit tests, contingency tables, nonparametric procedures, and power of tests; emphasizes when and why various tests are appropriate and how they are used. Prerequisite: Mathematics 263 or an introductory statistics course, Mathematics 130 or 134 or equivalent, and knowledge of basic matrix manipulations; or consent of instructor. 3 hours or 1 unit.
370. **Finite Differences.** Finite differences, finite integration, interpolation, difference equations, numerical integration, and iterative methods of solving equations. Prerequisite: Mathematics 240, 241, or 245, or equivalent. 3 hours or 1 unit.
371. **Actuarial Theory, I.** Single-life mortality functions, annuities, life insurance, premiums, and reserve. Prerequisite: Mathematics 310 or consent of instructor. 3 hours or 1 unit.
372. **Actuarial Theory, II.** Continuation of Mathematics 371. Emphasis is on multiple-life functions. Prerequisite: Mathematics 371. 3 hours or 1 unit.
373. **Combinatorial Algorithms.** Same as Computer Science 373. See Computer Science 373.
375. **Automata, Formal Languages, and Computational Complexity.** Same as Computer Science 375. See Computer Science 375.
377. **Recursive Functions.** Computable functions; Turing computability; recursively enumerable sets; the halting problem; Rice's theorem; recursion theorem; and

example of a priority argument. Prerequisite: Mathematics 375 or 314 or 317. 3 hours or 1 unit.

378. **Computer Application to Problems in Mathematics.** Same as Computer Science 378. See Computer Science 378.
381. **Vector and Tensor Analysis.** Vector spaces, transformation properties, covariant and contravariant tensors, and differential geometry of surfaces; with applications to relativity theory. Prerequisite: Mathematics 343 or equivalent, or consent of instructor. 3 hours or 1 unit.
383. **Linear Programming.** Same as Computer Science 383. Systems of linear inequalities, the standard canonical and general linear problems, and simplex methods of solution. Prerequisite: One year of calculus. 3 hours or 1 unit.
384. **Nonlinear Programming.** Iterative and analytical solutions of constrained and unconstrained problems of optimization; gradient and conjugate gradient solution methods; Newton's method, LaGrange multipliers, and duality and the Kuhn-Tucker theorem; and quadratic, convex, and geometric programming. Prerequisite: Mathematics 240, 241, or 245, and a knowledge of linear algebra equivalent to Mathematics 315, or equivalent, or consent of instructor. 3 hours or 1 unit.
385. **Differential Equations, II.** Continuation of Mathematics 345. Linear systems of differential equations, including a self-contained development of the necessary matrix theory; the Laplace transform; and nonlinear differential equations. Prerequisite: Mathematics 341 or 345. 3 hours or 1 unit.
386. **Laplace Transforms.** Basic operation rules of Laplace transforms through the complex-inversion theorem; applications to solutions of initial and boundary value problems in differential equations; and evaluation of Cauchy integrals. Other types of transforms are considered and used for solving differential equations. Prerequisite: Mathematics 343. 3 hours or 1 unit.
388. **Mathematical Methods in Engineering and Science.** Matrices, determinants, bounds and approximations to eigenvalues, introduction to linear operator theory and inner product spaces, orthogonal expansions, and Fourier transforms. Prerequisite: Mathematics 343 or equivalent. 3 hours or 1 unit.
391. **Switching Theory.** Same as Computer Science 391 and Electrical Engineering 391. Combinational electronic and relay switching networks; two-level design methods; and pulse-mode and fundamental mode sequential networks. Prerequisite: Computer Science 264, Electrical Engineering 290, or Mathematics 319, or consent of instructor. 3 hours or 1 unit.
392. **Finite State Machines.** Same as Electrical Engineering 392 and Computer Science 392. Synchronous machines: state reduction of incompletely specified machines, series parallel decomposition, state assignment, and machine behavior; asynchronous machines: state assignment, hazards, and interacting machines. Prerequisite: Mathematics 319 and Mathematics 391, or consent of instructor. 3 hours or 1 unit.
393. **Statistical Computing.** Examines statistical packages, numerical analysis for linear and nonlinear models, graphics, and random number generation and Monte Carlo methods. Prerequisite: Mathematics 364 or equivalent; knowledge of FORTRAN. 3 hours or 1 unit.
394. **Time Series Analysis.** Studies theory and data analysis for stationary and pre-stationed time series; examines auto-regressive moving average model building and statistical techniques; and discusses spectral model building and statistical analysis using windowed periodograms and Fast Fourier Transformations. Prerequisite: Mathematics 364. 3 hours or 1 unit.
400. **General Seminar.** General seminar required of all graduate students who have passed the departmental written qualifying examination for the Ph.D. 0 credit.
401. **Second Course in Abstract Algebra, I.** Isomorphism theorems for groups; solvability of p -groups; simplicity of the alternating group on 5 letters; Sylow theorems and Jordan-Holder theorem; principal ideal domains; Gauss' lemma; Eisenstein's criterion; fundamental theorem of Galois theory; finite fields; cyclotomic

- fields; and solvability of equations by radicals. Prerequisite: Mathematics 317 and 318. 1 unit.
402. **Second Course in Abstract Algebra, II.** Modules; Hilbert basis theorem; Krull-Schmidt theorem; Wedderburn theorem on semisimple rings; finitely generated modules over principal ideal domains, with applications to abelian groups and canonical forms for matrices; categories and functors; tensor products; and bilinear and quadratic forms. Prerequisite: Mathematics 401. 1 unit.
403. **Theory of Rings.** Ideal theory in commutative rings; structure of noncommutative rings. Prerequisite: Mathematics 402 or equivalent. 1 unit.
404. **Group Theory.** Structure of groups, derived groups, nilpotence and solvability, and extensions and products. Prerequisite: Mathematics 402 or equivalent. 1 unit.
405. **Algebraic Number Theory.** Further development of the theory of fields covering topics from valuation theory, ideal theory, units in algebraic number fields, ramification, function fields, and local class field theory. Prerequisite: Mathematics 402 or equivalent. 1 unit.
406. **Homological Algebra.** Definition and properties of the functors Ext and Tor; projective, injective, and flat modules; group extensions; dimensions of rings, and Hilbert theorem on syzygies. Prerequisite: Mathematics 402 or equivalent. 1 unit.
407. **Group Representation Theory.** Representation of groups by linear transformations, group algebras, character theory, and modular representations. Prerequisite: Mathematics 402 or equivalent. 1 unit.
408. **Lie Algebras.** Examples of Lie algebras (low dimensions, Lie algebras of Lie groups, free algebras, and universal enveloping algebra); Poincare-Birkhoff-Witt theorem; nilpotent and solvable algebras; Cartan subalgebras; structure of semisimple algebras; real forms; and representations. Prerequisite: Mathematics 401; credit or concurrent registration in Mathematics 402. 1 unit.
410. **Logical Foundations of Mathematics.** Development of the predicate calculus of first order as a framework for metamathematical investigations; consideration of the completeness and incompleteness theorems of Godel. Prerequisite: Mathematics 314 or 317, or consent of instructor. 1 unit.
411. **Model Theory.** Elements of model theory, including Lowenheim-Skolem theorems, categoricity, ultraproducts, and applications to algebra; decidability theory using both model theoretic methods and elimination of quantifiers. Prerequisite: Mathematics 410. 1 unit.
412. **Recursive Function Theory.** Introductions to recursive functions; study of properties of recursive and recursively enumerable sets; degrees of unsolvability; and the implications of the Church-Turing thesis. Prerequisite: Mathematics 410 or consent of instructor. 1 unit.
413. **Set Theory.** Zermelo-Fraenkel axiomatic set theory; consideration of basic concepts in set theory such as ordinal, cardinal, and rank. Prerequisite: Mathematics 410. 1 unit.
414. **Advanced Topics in Logic.** Prerequisite: Mathematics 410; consent of instructor. 1 unit.
415. **Advanced Topics in the Theory of Groups.** Prerequisite: Consent of instructor. 1 unit.
416. **Advanced Topics in Abstract Algebra.** Prerequisite: Consent of instructor. 1 unit.
418. **Graph Theory.** Structure of graphs; planarity and colorability of graphs; matrices associated with a graph; and automorphism group of a graph. Prerequisite: Mathematics 313, 317, or 319, or equivalent. 1 unit.
419. **Applied Modern Algebra.** A study of polynomial rings and finite fields with applications to the construction and decoding of codes, including BCH codes, correction of burst errors, codes from geometry, codes from Hadamard matrices, and Shannon's fundamental theorem. Prerequisite: Mathematics 317 or 319, or equivalent; or consent of instructor. 3 hours or 1 unit.
422. **Algebraic Geometry.** Properties of affine and projective varieties defined over algebraically closed fields; rational mappings, birational geometry and divisors,

- especially on curves and surfaces; introduction to the language of schemes; and Riemann-Roch theorem for curves. Prerequisite: Mathematics 402. 1 unit.
423. **Differentiable Manifolds.** Definition and properties of differentiable manifolds and maps, introducing vector fields, tangent bundles, differential forms, exterior derivatives, and foliations. Prerequisite: Mathematics 323 or 381, or consent of instructor. 1 unit.
424. **Riemannian Geometry.** Local and global properties of Riemannian manifolds. Prerequisite: Mathematics 423. 1 unit.
425. **Linear Analysis on Manifolds, I.** Study of topological invariants of differentiable and complex manifolds. Prerequisite: Mathematics 423 and 431, or consent of instructor. 1 unit.
426. **Linear Analysis on Manifolds, II.** Continuation of Mathematics 425. Prerequisite: Mathematics 425. 1 unit.
427. **Lie Groups.** Study of groups which are also differentiable manifolds. Prerequisite: Mathematics 423. 1 unit.
428. **Topics in Geometry.** Prerequisite: Consent of instructor. 1 unit.
430. **Elementary Geometry from a Modern Viewpoint.** Designed for secondary school teachers of mathematics; primary purpose is to discuss critically the logical structure and content of Euclidean geometry from the modern point of view; and consideration is given to the historical development of the modern approach. Prerequisite: Consent of instructor. 1 unit.
431. **Algebraic Topology, I.** Homological algebra techniques, simplicial and singular homology, fundamental group and covering spaces, and applications. Prerequisite: Mathematics 318 and 332; concurrent registration in Mathematics 401 or consent of instructor. 1 unit.
432. **Algebraic Topology, II.** Continuation of Mathematics 431. Axiomatic homology theory, fibrations and cofibrations, CW-complexes, cohomology products, and other topics. Prerequisite: Mathematics 431; concurrent registration in Mathematics 402. 1 unit.
433. **Fiber Spaces and Characteristic Classes.** Continuation of Mathematics 432. Study of fiber bundles and their associated characteristic classes; applications to geometric problems. Prerequisite: Mathematics 432. 1 unit.
435. **General Topology, I.** Study of topological spaces and maps, including Cartesian products, identifications, connectedness, compactness, uniform spaces, and function spaces. Prerequisite: Mathematics 332 or consent of instructor. 1 unit.
436. **General Topology, II.** Continuation of Mathematics 435. Prerequisite: Mathematics 435. 1 unit.
438. **Topics in Topology.** Prerequisite: Consent of instructor. 1 unit.
439. **Seminar in Topology.** Prerequisite: Consent of instructor. 1 unit.
440. **Theory of Functions of a Complex Variable, I.** Topics include the Cauchy theory, harmonic functions, entire and meromorphic functions, and the Riemann mapping theorem. Prerequisite: Mathematics 346 and 347, or Mathematics 348. 1 unit.
441. **Real Analysis, I.** Lebesgue measure on the real line; integration and differentiation of real valued functions of a real variable; and additional topics at discretion of instructor. Prerequisite: Mathematics 347 or equivalent. 1 unit.
442. **Real Analysis, II.** Abstract measure theory; integration on general measure spaces; and introduction to functional analysis. Prerequisite: Mathematics 441. 1 unit.
443. **Ordinary Differential Equations.** Existence, uniqueness, and continuation of solutions; topics selected from the following: the theory of linear differential operators, Sturm-Liouville theory, stability theory, and qualitative theory of differential equations. Prerequisite: Mathematics 347; a first course in ordinary differential equations. 1 unit.
444. **Partial Differential Equations.** A basic introduction to the study of partial differential equations; topics include: the Cauchy problem, power-series methods, characteristics, classification, canonical forms, well-posed problems, Riemann's method for hyperbolic equations, the Goursat problem, the wave equation,

- Sturm-Liouville problems and separation of variables, Fourier series, the heat equation, integral transforms, Laplace's equation, harmonic functions, potential theory, the Dirichlet and Neumann problems, and Green's functions. Prerequisite: Consent of instructor. 1 unit.
445. **Theory of Functions of a Complex Variable, II.** Continuation of Mathematics 440. Topics include subharmonic functions, Nevanlinna theory, analytic continuation and Riemann surfaces, and univalent functions. Prerequisite: Mathematics 440. 1 unit.
446. **Hilbert Space.** Geometrical properties of Hilbert spaces; linear operators; and the spectral theory for self adjoint and related operators. Prerequisite: Mathematics 442. 1 unit.
447. **Banach Spaces.** Geometrical properties of Banach spaces; bounded linear operators; applications to analysis; and linear topological spaces. Prerequisite: Mathematics 442. 1 unit.
448. **Harmonic Analysis.** Locally compact groups; Haar measure; Fourier analysis; and Tauberian theorems. Prerequisite: Mathematics 442. 1 unit.
449. **Banach Algebras.** Properties of Banach algebras and their representation as algebras of continuous functions or algebras of bounded linear operators; applications to spectral theory and harmonic analysis. Prerequisite: Mathematics 446 or 447. 1 unit.
450. **Ordered Spaces.** Study of ordered topological vector spaces and vector lattices and positive operators. Prerequisite: Mathematics 447. 1 unit.
451. **Theory of Probability, I.** Mathematical foundations of probability and stochastic processes; probability measures, random variables, distribution functions, convergence theory, the Central Limit Theorem, conditional expectation, and martingale theory. Prerequisite: Mathematics 442. 1 unit.
452. **Theory of Probability, II.** Continuation of Mathematics 451. Prerequisite: Mathematics 451. 1 unit.
453. **Analytic Theory of Numbers, I.** Problems in number theory treated by methods of analysis; topics chosen from prime number theory, Riemann zeta function, sieve methods, diophantine approximation, metric theory, partitions, lattice points, Waring's problem, and asymptotic properties of arithmetical functions. Prerequisite: Mathematics 317 or 348. 1 unit.
454. **Analytic Theory of Numbers, II.** Continuation of Mathematics 453. Prerequisite: Mathematics 453. 1 unit.
455. **Mathematical Methods of Physics.** Introduction to inner product spaces, linear operators, and Schwartz distribution theory; Green's functions for ordinary differential equations; and integral equations: Hilbert-Schmidt theory and Sturm-Liouville theory. Prerequisite: Mathematics 343 and 346. 1 unit.
456. **Mathematical Methods of Physics.** Calculus of variations: Euler-Lagrange theory, Rayleigh-Ritz method, and Dirichlet principle; integral transform methods and separation of variables; and approximation methods: finite differences, Galerkin's method, and asymptotic expansions. Prerequisite: Mathematics 455 or consent of instructor. 1 unit.
457. **Numerical Solution of Ordinary Differential Equations.** Same as Computer Science 457. See Computer Science 457.
458. **Topics in Numerical Analysis.** Same as Computer Science 458. See Computer Science 458.
460. **General Relativity and Cosmology.** Same as Astronomy and Physics 424. See Physics 424.
461. **Applied Stochastic Processes.** Introduction to topics such as spectral analysis, filtering theory, and prediction theory of stationary processes; Markov chains and Markov processes. Prerequisite: Mathematics 346 and 347. 1 unit.
463. **Information Theory.** Same as Computer Science 463 and Electrical Engineering 463. Mathematical models for information channels and sources; existence theorems for and construction of error-correcting codes. Prerequisite: Mathematics 361. 1 unit.

465. **Topics in Automata Theory.** Same as Computer Science 465 and Electrical Engineering 465. Prerequisite: Mathematics 392 or consent of instructor. 1 unit.
466. **Topics in Ordinary Differential Equations.** Introduction to current research in such areas as stability and asymptotic behavior of solutions; topological dynamics; numerical methods; and boundary value problems and spectral theory of differential operators. Prerequisite: Consent of instructor. 1 unit.
468. **Topics in Analysis.** Prerequisite: Consent of instructor. 1 unit.
469. **Seminar in Analysis.** Prerequisite: Consent of instructor. 1 unit.
470. **Statistical Decision Functions.** Statistics from the point of view of decision making; introduction to the theory of games; minimax and other decision functions; techniques for determining optimal decision functions; and applications to nonsequential and sequential decision making in practice. Prerequisite: Consent of instructor. 1 unit.
471. **Multivariate Analysis.** Inference in multivariate statistical populations emphasizing the multivariate normal distribution; derivation of tests, estimates, and sampling distributions; and examples from the natural and social sciences. Prerequisite: Mathematics 362 or 364 and Mathematics 315, or consent of instructor. 1 unit.
472. **Special Topics in Actuarial Theory.** Selected topics in advanced actuarial science. Prerequisite: Consent of instructor. 1 unit. May be repeated once for credit.
473. **The Theory of Testing Hypotheses.** Methods of constructing statistical tests which have optimum properties in small samples; the principles of invariance, unbiasedness, and similarity; and most stringent tests and minimax tests. Prerequisite: Consent of instructor. 1 unit.
474. **The Theory of Estimation.** Methods of constructing uniformly minimum variance unbiased estimates; minimax estimation; and estimation by confidence sets. Prerequisite: Consent of instructor. 1 unit.
475. **Topics in Combinatorics.** Same as Computer Science 475. See Computer Science 475.
476. **Coding Theory.** Same as Electrical Engineering and Computer Science 456. See Electrical Engineering 456.
477. **Graduation and Demography.** Construction and graduation of mortality and other tables; mathematical aspects of demography, especially measures of mortality and morbidity; and risk theory and reinsurance. Prerequisite: Mathematics 370 and 371. 1 unit.
478. **Topics in Statistics.** Prerequisite: Consent of instructor. 1 unit.
480. **Optimization by Vector Space Methods.** Same as Electrical Engineering 480. Introduction to normed, Banach, and Hilbert spaces; applications of the projection theorem and the Hahn-Banach Theorem to problems of minimum norm, least squares estimation, mathematical programming, and optimal control; the Kuhn-Tucker Theorem and Pontryagin's maximum principle; and introduction to iterative methods. Prerequisite: Mathematics 315 or 383, and Mathematics 347 or consent of instructor. 1 unit.
483. **Optimization in Networks.** Theory and methods for optimization over directed graphs; paths, cuts, flows, and potentials; matchings; PERT and CPM; max flow, min path, out-of-kilter, Hungarian, and other algorithms; nonlinear cost functionals; painting theory; and existence and duality. Prerequisite: Mathematics 240, 241, or 245. 1 unit.
484. **Conjugate Duality and Optimization.** Convex analysis for constrained extremum problems; convex sets, cones, and functions; separation; Fenchel transform; duality correspondences; differential theory; nonlinear programming; sensitivity; and perturbational duality for primal, dual, and Lagrangian problems. Prerequisite: Mathematics 315 and 347, or consent of instructor. 1 unit.
487. **Theory of Approximation.** Same as Computer Science 487. General approximation theory in normed linear spaces; primary emphasis on functions defined on an interval, and periodic functions; existence and uniqueness theorems; characterization of Chebyshev approximants; degree of approximation; interpolation

with emphasis on the quality of interpolants as approximants; and use of approximations in computing. Prerequisite: Mathematics 318 and 348, or consent of instructor. 1 unit.

- 488. **Topics in Applied Mathematics.** Prerequisite: Consent of instructor. 1 unit.
- 489. **Seminar in Applied Mathematics.** Prerequisite: Consent of instructor. 1 unit.
- 490. **Reading Course.** Prerequisite: Consent of instructor. 1 to 2 units.
- 499. **Thesis Research.** Prerequisite: Consent of instructor. 0 to 4 units

MECHANICAL AND INDUSTRIAL ENGINEERING

Head of Department: Professor B. T. Chao

Department Office: 152 Mechanical Engineering Building, 1206 West Green, Urbana

Industrial Engineering

- 199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 232. **Methods-Time Analysis.** Principles of motion economy affecting the design of a product or service; the effective use of human effort as related to the tools and equipment used in manufacturing and commercial endeavors; reasons for time study and the principles of determining time standards; study of standard data and other specific types of micromotion standards; and applications of all phases of the studies to specific cases. Prerequisite: Mechanical Engineering 185 or equivalent; junior standing. 3 hours.
- 238. **Analysis of Data.** Nature of probabilistic models for observed data; discrete and continuous distribution function models; inferences on universe parameters based on sample values; and introduction to control charts, acceptance sampling, and measurement theory. Prerequisite: Completion of basic calculus. 3 hours.
- 282. **Process Planning and Economy in Manufacturing.** Principles of engineering economy and their applications to manufacturing problems; studies of typical manufacturing processes and their economic factors; and exercises in planning processes for maximum efficiency. Prerequisite: Mechanical Engineering 185 or equivalent; senior standing in engineering. 3 hours.
- 287. **Job Evaluation and Wage Incentives.** Study of job evaluation techniques and wage incentive systems; problems of installing and maintaining job and position evaluation systems in industrial organizations. Prerequisite: Industrial Engineering 232 or equivalent; senior standing. 3 hours.
- 291. **Seminar.** A series of lectures by faculty and invited authorities from the profession concerning the ethics and practices of industrial engineering in their relationship to other fields of engineering, economics, and the problems of society. Prerequisite: Junior standing in industrial engineering; must be taken in Spring Semester. 0 credit.
- 293. **Special Projects.** Experimental and analytical investigation in industrial engineering research. Prerequisite: Senior standing in industrial engineering; consent of head of department. 3 hours..
- 296. **Honors Project.** Special project or reading course for James Scholars in engineering. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
- 297. **Honors Seminar.** Special lecture sequence and/or discussion groups arranged each semester to bring James Scholars in engineering into direct contact with the various aspects of engineering practice and philosophy. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
- 299. **Thesis.** Investigation of special subjects and preparation of thesis embodying report on investigation, review of literature, and discussion of results. Prerequisite: Industrial Engineering 293 or 296. 3 hours.

- 305. Principles of Ergonomics.** Same as Physiology and Physical Education 305. Concepts and design criteria to achieve optimum mutual adjustment of man and his work; consideration of such topics as static and dynamic forces on the human frame; response to environmental stress (heat, vibration, noise); vigilance and fatigue; and man-machine systems. Prerequisite: Senior standing; consent of instructor. 4 hours or 1 unit.
- 332. Standard Time Systems.** The study of development, uses, and limitations of standard time data and predetermined time systems. Prerequisite: Industrial Engineering 232. 3 hours, or 3/4 or 1 unit.
- 334. Introduction to Reliability Engineering.** Same as General Engineering 334. An introduction to concepts in engineering design, testing, and management for highly reliable components and systems. Prerequisite: Industrial Engineering 238 or Mathematics 361, or equivalent with consent of instructor. 3 hours, or 3/4 or 1 unit.
- 335. Industrial Quality Control.** Control charts for attributes and variables; modified control chart techniques; acceptance sampling for attributes and variables; relationship to design, production, and procurement; quality cost analysis; military standards practice; survey and reports of current quality literature; and management of quality programs. Prerequisite: Industrial Engineering 238 or consent of instructor. 3 hours, or 3/4 or 1 unit.
- 336. Design and Analysis of Industrial Experimentation.** Randomized blocks, t-tests, and factorial and fractional factorial designs; concepts of randomization, blocking, screening, and confounding; second-order designs, response surface methodology, and evolutionary operation; and introduction to mechanistic model building and nonlinear estimation. All topics are treated through engineering applications and case studies. Prerequisite: Industrial Engineering 238 or equivalent, or consent of instructor. 3 hours, or 3/4 or 1 unit.
- 350. Computer-aided Manufacturing Systems.** The application of computer technology and operations research in manufacturing systems; includes the use of minicomputers and microprocessors for direct numeric control of machine tools, adaptive control and optimization, and integrated manufacturing systems, including applications of industrial robots. Prerequisite: Mechanical Engineering 185 or consent of instructor. 3 hours, or 3/4 or 1 unit.
- 355. Numerical Control of Manufacturing Processes.** Study of numerical control systems, manufacturing processes, principles and practices basic to numerical control, and programming methodology for numerical control. Prerequisite: Mechanical Engineering 185 or consent of instructor; background in computer technology. 3 hours, or 3/4 or 1 unit.
- 357. Safety Engineering.** Study of engineering principles applied to industrial accident prevention; safe plant layout; safety in maintenance; boilers and pressure vessels; design and application of machine guards; material handling and storage; hand and power tools; welding hazards; electrical hazards; flammable liquids and fire protection; industrial health engineering; and toxic materials. Prerequisite: Senior standing in engineering or consent of instructor. 3 hours, or 3/4 or 1 unit.
- 360. Analysis of Materials Machining.** An analytical approach to the mechanics and physics of various machining processes; covers the basic phenomena underlying process characteristics, such as wear, plastic flow, surface integrity, friction, and economics. Prerequisite: Mechanical Engineering 185 or 234, or consent of instructor. 3 hours, or 3/4 or 1 unit.
- 385. Operations Research, I.** A first course in operations research techniques and their application to systems analysis and design; includes linear programming, linear models, simplex method, transportation methods, assignment algorithms, sensitivity analysis, dynamic programming, and introduction to inventory and queueing theory. May not be used toward fulfillment of the M.S. in industrial engineering degree requirements nor toward the Ph.D. in mechanical engineering degree requirements for industrial engineering majors. Prerequisite: Industrial Engineering 238 or equivalent. 3 or 4 hours, or 3/4 or 1 unit.

- 386. Operations Research, II.** Continuation of Industrial Engineering 385; includes advanced linear programming, matrix forms, revised simplex method, bounded variables, primal-dual methods, parametric programming, integer programming, stochastic processes, queues, inventories, maintenance, simulation, and modeling; and emphasizes model building and treatment of uncertainty. Prerequisite: Industrial Engineering 385 or equivalent. 3 or 4 hours, or 3/4 or 1 unit.
- 388. Applications of Operations Research to Industrial Systems.** Application of operations research and systems analysis techniques to problems in engineering and management; uses cases and games to introduce the student to problem formulation, decision making, and evaluation of results; and includes introductory decision theory, network models, project planning with CPM and PERT, scheduling and sequencing, assembly line balancing, and replacement models. Prerequisite: Industrial Engineering 385 or equivalent. 3 hours, or 3/4 or 1 unit.
- 393. Special Problems.** Study of advanced problems related to industrial engineering. Prerequisite: Senior standing or consent of instructor. 1 to 4 hours, or 1/2 to 1 unit.
- 401. Mathematical Programming, I: Applied Nonlinear Programming.** Optimization of nonlinear systems, including a survey of classical methods and concepts such as the Lagrangian method, the Jacobian method, and Kuhn-Tucker conditions; emphasizes modern algorithms, numerical methods for digital computers, applications in engineering design, and use of state of the art computer codes. Prerequisite: Industrial Engineering 386 or equivalent, or consent of instructor. 1 unit.
- 402. Mathematical Programming, II: Dynamic and Geometric Programming.** The formulation and construction of dynamic programming models and advanced dynamic programming concepts such as treatment of multistate variables, nonserial systems, and Markov processes; geometric programming, including treatment of degree of difficulty, mixed signs, and computational refinements; and emphasis on applications in engineering design. Prerequisite: Industrial Engineering 386 or equivalent. 1 unit.
- 416. Systems Analysis, I: Systems Methodology and Network Techniques.** Same as Civil Engineering 416. Basic concepts, theories, and techniques of systems analysis, including modeling of large scale systems, forecasting, planning, control, and information handling; emphasizes the modeling of systems with network techniques, including distance, flow, and project networks; and discusses advanced network topics such as out-of-kilter algorithm and project resource analysis. Prerequisite: Industrial Engineering 388 or Civil Engineering 292, or equivalent, or consent of instructor. 1 unit.
- 417. Systems Analysis, II: Digital Simulation.** Same as Civil Engineering 417. The application of simulation techniques to systems analysis; includes modeling for simulation, design of simulation experiments, random number generation, process generation, simulation of queueing systems, inventory systems, and project networks, analysis of simulation results, and some digital simulation languages and programs in use, such as GASP II and GERTS III. Prerequisite: Industrial Engineering 385 or Civil Engineering 293, and some exposure to computer programming. 1 unit.
- 454. Production Engineering.** Advanced consideration of production engineering principles as related to cost analysis and reduction, control of flow of work in manufacture, evaluation of performance against standard, and compensation; special investigations. 1 unit.
- 458. Laboratory Investigations in Industrial Engineering.** Special investigations of such problems as optimization of operations, programming systems, work standards, plant layout, and flow of materials. 1/2 to 1 1/2 units.
- 473. Ergonomics Seminar.** Same as Physiology 473 and Physical Education 473. In-depth exploration of topics in ergonomics such as effects of vibration on human performance, biomechanics of the hand, and functional dimension. Prerequisite: Consent of instructor. 1/2 unit

Mechanical Engineering

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
205. **Thermodynamics.** Introduction to classical thermodynamics through the second law; system and control volume analyses of thermodynamic processes; irreversibility and availability; relations among thermodynamic properties; and discussion of microscopic aspects. Prerequisite: Mathematics 240, 241, or 245; Physics 107. 3 hours.
207. **Thermodynamics.** Energy and its transformations; properties of thermodynamic media, including kinetic theory analysis; thermodynamic processes of open and closed systems; reversibility and limitations; entropy and the second law; thermodynamics temperature scales; and second law analysis of chemically reactive systems. Prerequisite: Mathematics 240, 241, or 245; Physics 107. 3 hours.
209. **Thermodynamics and Heat Transfer.** Thermodynamic analysis of energy transfer and transformation; properties of simple working substances; analysis of open and closed systems, direct and reversed cycles, and processes involving transfers of mass and energy; and basic laws of heat transfer. Prerequisite: Mathematics 240, 241, or 245; Physics 107. 3 hours.
210. **Introduction to Engineering Experimentation.** Design and planning of engineering experiments on the basis of scientific analysis; execution of basic engineering experiments using fundamental measurement instruments and techniques; analysis, correlation, and evaluation of experimental data using mathematical and statistical concepts; and introduction and utilization of analog and digital computer methods. Prerequisite: Concurrent registration in Mathematics 345 and Mechanical Engineering 220. 3 hours.
211. **Introductory Gas Dynamics.** Introduction to dynamics; special emphasis on the theory and engineering applications of compressible high velocity flows. Prerequisite: Mathematics 345, Physics 107, and credit or registration in Mechanical Engineering 205. 3 hours.
213. **Heat Transfer.** Principles and application of heat transfer by conduction, convection, and thermal radiation. Prerequisite: Mechanical Engineering 211. 3 hours.
220. **Mechanics of Machinery.** Fundamentals of linkages, design of cams, kinematics of gearing, analysis of gear trains, velocity, acceleration and force analysis of systems of rigid bodies, and balance of rigid rotors and reciprocating machinery. Prerequisite: Engineering mechanics (statics and dynamics) and credit or registration in Computer Science 101. 3 hours.
225. **Mechanism, Kinematics and Design.** Linkages, cams and gears, velocities, accelerations, inertia forces, vibrations, fasteners, springs, clutches and other machine elements. Prerequisite: Theoretical and Applied Mechanics 154 and 221. 4 hours.
231. **Introduction to the Science of Materials.** Relates atomic structures of materials to bonding and structure in crystalline and non-crystalline solids; uses elementary thermodynamic concepts in discussing phase diagrams, phase transformations, corrosion, and oxidation; discusses mechanical behavior of materials and its relationship to crystal structure, dislocations, and strengthening mechanisms; describes structural-property relations in ceramics from atomistic and microstructural points of view; introduces polymers and polymerization mechanisms and relates their structure to mechanical properties; and describes composite materials and their failure modes. Prerequisite: Junior standing in engineering. 3 hours.
232. **Thermal Processing of Materials.** Discusses thermal processing of materials with reference to solidification, heat treatment and welding of metals, extrusion and molding of polymers, and sintering of ceramics; relates control of shape, structure, and properties of materials to the fundamentals of heat flow, solidification, and heat treatment; and describes processing of thermosetting plastics and thermoplastics, vulcanization, and fiber manufacture. Prerequisite: Mechanical Engineering 231. 2 hours.

- 233. Materials Laboratory.** Materials laboratories dealing with the following subjects: crystallography, metallography, mechanical testing, solidification and foundry, recrystallization, age hardening, hardenability, fracture, and mechanical properties of polymers. Prerequisite: Concurrent registration in Mechanical Engineering 232. 1 hour.
- 240. Modeling and Analysis of Dynamic Systems.** Dynamic analysis of mechanical systems; modeling of mechanical components and systems; analysis of single and multiple degree of freedom linear systems; simulation of nonlinear systems; introduction to continuous systems and lumping techniques; and introduction to feedback control systems. Prerequisite: Mechanical Engineering 220, Mathematics 345, and Theoretical and Applied Mechanics 221. 4 hours. Credit is not given for both Mechanical Engineering 240 and General Engineering 222.
- 250. Thermal Science Laboratory.** Basic experiments in thermodynamics, gas dynamics, and heat transfer and their applications; experiments selected to introduce pertinent instrumentation and experimental techniques, and to further the understanding of fundamentals via physical observations. Prerequisite: Mechanical Engineering 205 and 213. 3 hours.
- 261. Introduction to Instrumentation, Measurement, and Control Fundamentals.** Same as Electrical Engineering 261. Basic elements of a measurement system; recording instruments, transducers, and signal conditioning; and data recording and controls, analog and digital devices and control. Prerequisite: Electrical Engineering 260. 3 hours.
- 270. Analysis and Design of Machines.** Applications of mathematics, material science, and engineering mechanics to problems in analysis and design of machine components; considers function, production, and economic factors of design; and includes fasteners, springs, gearing, bearings, shafting, clutches, and lubrication. Prerequisite: Mechanical Engineering 220 and 231 and Theoretical and Applied Mechanics 221. 4 hours.
- 275. Creativity in Engineering Design.** Study of engineering systems to show the creative use of scientific principles and design procedures; survey of natural laws and examples of their creative application; and introduction to methods for promoting creativity in engineering. Prerequisite: Mechanical Engineering 271. 3 hours.
- 284. Welding Engineering.** Fundamentals of welding and metallurgical effects of temperature cycles involved; physical effects of energy input rates and welding processes on mechanical properties; residual stresses and distortion control; design and economics of welded structures; and laboratory involving welding, physical tests, and metallurgical study of welded joints. Prerequisite: Mechanical Engineering 234 or equivalent; senior standing. 3 hours.
- 285. Analysis of Manufacturing Processes.** Introduction to materials processing methods, including chip formation and deformation processes; analysis of process performance, including forces and energy, surface roughness, tool wear and tool life, and dimension precision; machine tool dynamics and vibrations, process planning, and optimization; nontraditional machining processes; introduction to numerical control of machine tools; and polymer processing and the use of various materials including plastics. Prerequisite: Mechanical Engineering 231 or equivalent. 3 hours.
- 291. Seminar.** A series of lectures by faculty and invited authorities from the profession concerning the ethics and practices of mechanical engineering in their relationship to other fields of engineering, economics, and the problems of society. Prerequisite: Junior standing in mechanical engineering; must be taken in Spring Semester. 0 credit.
- 293. Special Projects.** Experimental and analytical investigation in mechanical engineering research. Prerequisite: Senior standing in mechanical engineering; consent of head of department. 3 hours.
- 296. Honors Project.** Special project or reading course for James Scholars in engineering. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.

297. **Honors Seminar.** Special lecture sequence and/or discussion groups arranged each semester to bring James Scholars in engineering into direct contact with the various aspects of engineering practice and philosophy. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
299. **Thesis.** Investigation of special subjects and preparation of thesis embodying report on investigation, review of literature, and discussion of results. Prerequisite: Mechanical Engineering 293 or 296. 3 hours.
301. **Thermodynamics.** Basic considerations of the three laws of thermodynamics; elementary statistical principles for the prediction of properties of pure substances and mixtures; transport properties; and electric and magnetic systems. Prerequisite: Mechanical Engineering 206 or equivalent; consent of instructor. 3 hours, or 3/4 or 1 unit.
302. **Nuclear Power Engineering.** Same as Nuclear Engineering 302. See Nuclear Engineering 302.
303. **Multiphase Flow Systems.** Same as Civil Engineering 359. Theory and application of the basic relations of fluid dynamics, thermodynamics, and heat transfer to the motion of aerosols and hydrosols, with application to problems in air and water pollution. Prerequisite: Senior or graduate standing. 3 hours or 1 unit.
304. **Energy Conversion Systems.** Analyzes processes and systems for energy conversion; design cases include power and refrigeration cycles, thermionics, thermoelectrics, fuel cells, and radiation batteries. Prerequisite: Mechanical Engineering 205, 207, or 209; or consent of instructor. 3 hours or 3/4 unit. May not be taken for credit by graduate students in mechanical engineering.
305. **Thermodynamics of High-Velocity Flow.** The thermodynamics of gases during high-velocity flow within enclosed channels using Mach number as the fundamental variable; analyses of the basic flow equations, effects of friction, and plane shock theory; and application to thermodynamic cycles involving nozzles, diffusers, compressors, combustion, and turbines. Prerequisite: Mechanical Engineering 205 and 211, or equivalent. 3 hours, or 3/4 or 1 unit.
306. **Industrial Heat Transfer.** Theory and application of numerical, analogical, and experimental methods to selected heat transfer problems; application of principles of convection, condensation, and boiling heat transfer to design of heat exchange equipment. Prerequisite: Undergraduate courses in fluid mechanics and heat transfer, or consent of instructor. 4 hours or 1 unit.
307. **Solar Energy Utilization.** Emphasizes solar thermal processes; considers basic sun-earth geometry, the optics of solar energy collectors, and associated heat transfer mechanisms in detail; and includes flat plate collectors, concentrating collectors, energy storage, modeling and system simulation, and economics. Prerequisite: Mechanical Engineering 213 or consent of instructor. 3 hours, or 3/4 or 1 unit.
311. **Instrumentation and Measurements.** Same as Agricultural Engineering 311. See Agricultural Engineering 311.
312. **Modern Control Theory.** The concept of state; state-space representation of systems; transfer function decomposition and state-variable diagrams; state response of continuous and discrete-data systems; determination of the transition matrix; diagonalization; state response of time-varying systems; controllability and observability; stability and Lyapunov's method; and introduction to optimization and design. Prerequisite: Mechanical Engineering 265 or equivalent, or consent of instructor. 4 hours or 1 unit.
313. **Computer Control of Mechanical Engineering Systems.** Examines microcomputer control of thermal and mechanical systems: sensing and transducing of variables, transmitting and converting signals, and actuating regulators associated with mechanical engineering systems. Prerequisite: Mechanical Engineering 261 or Agricultural Engineering 311. 3 hours, or 3/4 or 1 unit.
314. **Lubrication.** The theoretical basis of lubrication, hydrodynamic bearing theory, and properties of lubricants; lubrication methods and appliances; and study of the lubrication requirements of machines of many kinds. Prerequisite: Undergraduate courses in machine design and fluid mechanics. 3 hours, or 3/4 or 1 unit.

- 321. Refrigeration and Cryogenics.** The theory of operation and the design of equipment for the production of low temperatures from below ambient down to near absolute zero; applications to industrial, consumer, aerospace, medical, and various research uses. Prerequisite: Mechanical Engineering 205, 211, and 213, or consent of instructor. 3 hours, or 3/4 or 1 unit.
- 323. Design of Thermal Systems.** Selection of components in fluid- and energy-processing systems to meet system performance requirements; computer-aided design; system simulation; optimization techniques; and investment economics and statistical combinations of operating conditions. Prerequisite: Mechanical Engineering 206, 211, and 213. 3 hours, or 3/4 or 1 unit.
- 331. Internal Combustion Engines.** Study of the fundamental principles underlying the theory and analysis of reciprocating internal combustion engines, fuels, carburetion, combustion, exhaust emissions, detonation, fuel injection, and factors affecting performance; basic laboratory work involving measurements of effects of variables on performance. Prerequisite: Credit or registration in Mechanical Engineering 206, or consent of instructor. 3 hours, or 3/4 or 1 unit.
- 332. Theory of Internal Combustion Engines.** Analysis of internal combustion engines, including thermodynamics, combustion and effects of mixtures, chemical equilibrium and dissociation, exhaust emissions and air pollution, flow through valves, breathing, supercharging and turbocharging, lubrication, friction, and combustion chamber design. Prerequisite: Mechanical Engineering 331 or equivalent, or consent of instructor. 3 hours or 1 unit.
- 333. Air Pollution and Combustion.** Same as Aeronautical and Astronautical Engineering 335 and Civil Engineering 358. See Aeronautical and Astronautical Engineering 335.
- 335. Power Systems Engineering and Economy.** Application of thermodynamic principles and fluid flow and heat transfer processes to power systems; determination of system characteristics and methods to satisfy these requirements with awareness of economic factors and ecological considerations. Prerequisite: Mechanical Engineering 206, 211, and 213, or equivalent. 3 hours, or 3/4 or 1 unit.
- 336. Automotive Vehicle Dynamics.** Introduction to the dynamics and control of automotive multidegree of freedom systems; the development and solution of governing equations for both steady state and transient conditions by computer simulation techniques; investigation of the performance, handling, and safety aspects of vehicles and their interaction with external and internal interfaces; examination of the influence of tires, suspension, steering, and aerodynamic forces; and laboratory experiments and demonstrations. Prerequisite: Mechanical Engineering 265 or equivalent, or consent of instructor. 4 hours or 1 unit.
- 341. Engineering Analysis and Design.** Correlation of previously acquired design experience with the creative problem of synthesis and analysis that depend upon design judgment. Prerequisite: Mechanical Engineering 271 or senior standing, or consent of instructor. 3 hours, or 3/4 or 1 unit.
- 342. Kinematic Analysis and Synthesis.** Geometry of constrained motion; application of mathematical and other techniques to the kinematic analysis and synthesis of mechanisms. Prerequisite: Undergraduate course in kinematics and senior standing, or consent of instructor. 3 hours, or 3/4 or 1 unit.
- 343. Dynamics of Machinery.** A course complementary to the undergraduate course; emphasis on the analytical approach to the study of dynamic forces in machines, balancing, critical speeds, shaft vibration, governors, and gyroscopes. Prerequisite: Mechanical Engineering 220 and senior standing, or consent of instructor. 3 hours, or 3/4 or 1 unit.
- 344. Introduction to Optimal Mechanical Design.** Optimal design of mechanical elements and systems; stresses problem formulation, emphasizing derivation and solution of governing equations; and includes choice of appropriate optimization techniques and sensitivity analysis. Topics range from unconstrained single-parameter optimization of mechanical elements to constrained multi-parameter optimization of systems of mechanical elements. Prerequisite:

- Mechanical Engineering 224 or equivalent, or consent of instructor. 3 hours, or 3/4 or 1 unit.
375. **Introduction to Bionics.** Biological concepts and data aiding in the solution of engineering problems; analysis of mechanisms found in living systems and their application to the design of mechanical devices. Prerequisite: Mechanical Engineering 224 or consent of instructor. 3 hours, or 3/4 or 1 unit.
388. **Industrial Control Systems.** The study of industrial control techniques by case studies of actual industrial systems; provides competence in the design, selection, and maintenance of industrial control systems; and introduces applications to electromechanical, pneumatic, thermal, and hydraulic systems. Prerequisite: Mechanical Engineering 265 or equivalent, or consent of instructor. 3 hours, or 3/4 or 1 unit.
389. **Transport Phenomena in Metals Processing.** Same as Metallurgical Engineering 389. See Metallurgical Engineering 389.
393. **Special Problems.** Study of advanced problems related to mechanical engineering. Prerequisite: Senior standing or consent of instructor. 1 to 4 hours, or 1/2 to 1 unit.
401. **Thermodynamics and Transport Properties.** Thermodynamic and microscopic considerations for the prediction of properties; caratheodory principle; relations among properties; microscopic considerations and statistical methods; thermodynamic and transport properties; and fluctuation and nonequilibrium thermodynamics. Prerequisite: Mechanical Engineering 301 or consent of instructor. 1 unit.
402. **Nonequilibrium Processes.** Dynamics and thermodynamics of multiphase and multicomponent systems with special relevance to air pollution control and energy conversion; relaxation phenomena; general motion of systems of disparate elemental masses; diffusion in gravitational and electric fields, and boundary layer motion with mass transport; dispersion and collection of particulate matter; and transport with surface reactions. Prerequisite: Mechanical Engineering 301 and 303, or consent of instructor. 1 unit.
403. **Fundamentals of Combustion.** Same as Aeronautical and Astronautical Engineering 438. See Aeronautical and Astronautical Engineering 438.
404. **Gas Dynamics, I.** Introduction to theoretical gas dynamics; fundamental laws and basic equations for subsonic, transonic, and supersonic steady and unsteady flow processes. Prerequisite: Mechanical Engineering 305 or equivalent, or consent of instructor. 1 unit.
405. **Convective Heat Transfer.** Fundamentals of convective heat transfer; calculation of heat transfer within conductor and over submerged objects for laminar and turbulent flow; natural convection; film condensation and boiling; and liquid metals. Prerequisite: Mechanical Engineering 306 or consent of instructor. 1 unit.
406. **Heat Conduction in Solids.** Fundamentals of heat conduction in isotropic and anisotropic solids; methods of solution to steady and transient heat conduction problems in one, two, and three dimensions; internal heat sources; periodic flow of heat; problems involving phase change; and approximate analytical techniques. Prerequisite: Mechanical Engineering 306 or Mathematics 346, or consent of instructor. 1 unit.
408. **Laboratory Investigation in Thermodynamics.** Special investigations involving thermodynamic analysis, thermodynamic properties, and performance of physical and chemical systems. Prerequisite: One-year course in thermodynamics; one half-year course in thermal science laboratory or equivalent. 1/2 to 1 1/2 units.
409. **Laboratory Investigations in Fluid Flow, Heat Transfer, and Combustion.** Special investigation in flow, metering, heat transfer, and heat exchanger performance and design. Prerequisite: Courses in thermodynamics and fluid mechanics. 1/2 to 1 1/2 units.
410. **Thermal Radiation.** Fundamentals of radiant energy transport in absorbing and nonabsorbing media; pyrometry; and applications to selected problems involving combined energy transport mechanisms. Prerequisite: Mechanical Engineering 306 or consent of instructor. 1 unit.

- 411. Control of Air Pollution from Stationary Sources.** Same as Civil Engineering 448. See Civil Engineering 448.
- 423. Thermal Systems.** Steady-state simulation and optimization of thermal systems, dynamic performance, and probabilities in system design. Prerequisite: Mechanical Engineering 323. 1 unit.
- 428. Investigations in Thermal Systems.** Investigations in the modeling, simulation, and optimization of thermal systems such as power generating, heating and cooling, and thermal processing systems. Prerequisite: Consent of instructor. 1/2 to 1 1/2 units.
- 429. Investigations in Environmental Control.** Investigations in heating, ventilating, air conditioning, and human comfort. Prerequisite: Consent of instructor. 1/2 to 1 1/2 units.
- 432. Theory of Rotary Compressors.** Thermodynamical and mechanical fundamentals; compression with and without cooling; classification of compressors; similarity considerations and characteristics; principles of and computations for radial compressors; improvement in performance of integrating parts; axial flow compressors; lattice and airfoil theory; change in operating conditions of turbo-compressors; regulation; and rotary positive blowers. Prerequisite: Mechanical Engineering 205, 206, and 211; or Aeronautical and Astronautical Engineering 211. 1 unit.
- 438. Laboratory Investigations in Power Machinery.** Special investigations in power machinery, such as turbines, engines, fans, and compressors. Prerequisite: One-year course in power laboratory. 1/2 to 1 1/2 units.
- 440. Analysis, Modeling, and Design of Man-Machine Systems.** Input-output models of man as an information processor, controller, and decision maker are critically evaluated and applied to the analysis and design of specific man-machine systems. Intended for graduate students working in areas of man-machine systems, engineering psychology, control systems, or operations research. Prerequisite: Mechanical Engineering 265 and Industrial Engineering 238, or equivalent and consent of instructor. 1 unit.
- 441. Machine Design.** A technical application course that focuses the previously acquired design experience on the creative problem of developing machines to perform specified functions; proper considerations of manufacturing processes involved; and checking of all parts for stress, wear, vibration, fatigue, etc. Prerequisite: Undergraduate course in dynamics of machines; one year of machine design. 1 unit.
- 443. Dynamics of Machinery.** Complementary to the undergraduate course and devoted to a more detailed study of velocities, accelerations, and forces in machine parts having reciprocating, rotating, and combined motions; balancing; flywheels; and special topics. Prerequisite: Undergraduate course in dynamics of machines; one year of machine design. 1 unit.
- 445. Design of Internal Combustion Engines.** Comprehensive study of the design of internal combustion engines, including gas forces, inertia loads, bearing analysis, torsional vibration, balance, lubrication, valve and cam design, and stress analysis of major parts of the engine. Prerequisite: Mechanical Engineering 271, 331, or equivalent. 1 unit.
- 448. Laboratory Investigations in Machine Design.** Special investigations in machine design. 1/2 to 1 1/2 units.
- 452. Solidification Processing.** Same as Metallurgical Engineering 452. Principles of control of structure, properties, and shape in processes involving liquid/solid transformations; stresses heat flow, mass transport, solute redistribution, nucleation and growth kinetics; and the relationship between process variables and structures and properties in the resultant material. Examples are drawn from existing commercial and new developing processes. Prerequisite: Metallurgical Engineering 370 or 389, Mechanical Engineering 234, or consent of instructor. 1 unit.

493. **Seminar.** Required of all graduate students each semester with the exception of doctoral candidates who have passed their preliminary examination. Presentation and discussion of significant developments in mechanical engineering. 1/4 unit.
497. **Special Problems in Mechanical Engineering.** Lectures, seminars, and individual investigations or studies in selected areas of mechanical engineering. Prerequisite: Consent of instructor. 0 to 1 unit. May be repeated.
499. **Thesis Research.** 0 to 4 units

MEDICAL SCIENCES

Dean of School: Professor D. K. Bloomfield

School Office: 190b Medical Sciences Building, 506 S. Mathews, Urbana

300. **Medical Sciences.** First-year program in preparation for the M.D. degree involving guided study of anatomy, behavioral science, biochemistry, genetics, immunology, microbiology, neuroscience, pathology, pharmacology, physiology, and reproductive biology. Elements of clinical experience are included. Learning experiences are monitored and presented by faculty in the clinical and basic medical sciences. Prerequisite: Enrollment is limited to students accepted by the College of Medicine. 19 hours (summer session, 9 hours).
301. **Clinical Medicine.** Second-year program in preparation for the M.D. degree involving classroom and clinical instruction in skills required for acquisition of clinical data base (history- taking, physical exam, lab use, biostatistics); basic pathology and pharmacology; and patho-physiological bases of clinical problems. For instructional purposes, medicine is divided into seventeen clinical problems (fever, pain, coma, etc.). Faculty present and monitor learning experiences, which include lecture/discussion, tutorials, and supervised clinical experiences. Prerequisite: Limited to second-year students in the College of Medicine. 19 hours (summer session, 9 hours).
302. **Supervised Medical Practice.** Third year of preparation for the M.D. degree. Students rotate among affiliated hospitals in medicine, surgery, obstetrics and gynecology, pediatrics, and other fields and are assigned to patient care teams. Physicians and clinical faculty supervise their clinical practice. Increases students' understanding of the pathophysiological basis of patient problems and teaches patient management skills. Prerequisite: Third-year standing in the College of Medicine. 19 hours (summer session, 9 hours).
303. **Medical Electives.** Fourth year of preparation for the M.D. degree. With approval and guidance of their faculty advisor, students select a program of elective courses which will enhance their clinical skills. These elective courses may be in medicine, surgery, obstetrics and gynecology, pediatrics, family practice, urology, dermatology, basic science or clinical research, and other fields approved by the Elective Committee. Prerequisite: Fourth-year standing in the College of Medicine. 19 hours (summer session, 9 hours).
370. **Patient Assessment.** Introduction for nurses and nursing students to basic techniques for eliciting a medical history and performing a physical examination; simulated patients, practical instructors, paired practice, and videotape techniques facilitate instruction by M.D.'s and mid-level health care practitioners. Prerequisite: Consent of instructor. 9 hours.
374. **General Epidemiology.** Same as Environmental Studies, Health Education, and Veterinary Pathobiology 374. See Health Education 374

METALLURGY AND MINING ENGINEERING

Head of Department: Professor C. A. Wert

Department Office: 201 Metallurgy and Mining Building, 1304 W. Green, Urbana

Metallurgical Engineering

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
296. **Metallurgical Seminar.** Review of current metallurgical literature; classroom reports and discussions; and preparation of technical abstracts and reports. Prerequisite: Senior standing in metallurgical engineering. 2 hours.
299. **Thesis.** Investigation of special problems and preparation of a thesis. May be substituted for certain technical subjects in the senior year. Prerequisite: Senior standing; approval of head of department. 1 to 3 hours.
301. **Welding and Joining Processes.** Same as Civil Engineering 375. The physical principles of fusion welding; heat flow; thermal cycles; physical metallurgy and mechanical properties of welded joints; applications of welding to large structures; testing of welds; nondestructive testing; design, economics, and weld specifications; and laboratory experiments in welding. Prerequisite: Theoretical and Applied Mechanics 224 or equivalent. 3 hours, or 3/4 or 1 unit.
306. **Design of Engineering Alloys.** A study of the fundamental principles which determine the constitution, structure, treatment, and application of alloy steels and other special-purpose high-performance alloys. Prerequisite: Metallurgical Engineering 372. 3 hours, or 3/4 or 1 unit.
307. **Corrosion of Metals.** Electrochemistry, thermodynamics, and kinetics of corrosion; behavior of ferrous and nonferrous metals; corrosion rates; corrosion control; cathodic and anodic protection; high-temperature corrosion; corrosion testing; and electrolytic machining methods. Prerequisite: Mechanical Engineering 234 or equivalent. 3 hours, or 3/4 or 1 unit.
310. **Crystallography and Diffraction.** Study of structure and composition of solids using X-rays and electron beams; radiography, spectroscopy, and X-ray and electron metallography. Prerequisite: Physics 108. 4 hours or 1 unit.
312. **Ternary Phase Diagrams.** Interpretation of ternary phase diagrams and applications to engineering alloy systems. Prerequisite: Metallurgical Engineering 334 or 370 or equivalent, or consent of instructor. 1 hour or 1/4 unit. Students may not receive credit for both Metallurgical Engineering 312 and Ceramic Engineering 205.
314. **Metallurgical Thermodynamics.** Thermodynamic principles applied to the study of phase and chemical equilibrium and to the calculation of free energy of phases. 3 hours or 3/4 unit.
316. **Mechanical Metallurgy.** Fundamentals of plastic deformation of crystalline solids; elementary theory of statics and dynamics of dislocations; applications to deformation of single crystals and polycrystals; fracture; and effect of metallurgical variables on mechanical properties. Prerequisite: Junior standing in engineering or consent of instructor. 3 hours or 3/4 unit.
317. **Fracture Mechanisms and Failure Analysis.** Mechanisms of the various forms of fracture of metals and alloys; relationships between microstructure and resistance to common modes of fracture; environmental effects on fracture; alloy design to optimize fracture resistance; and failure analysis using optical and electron microscopy. This course emphasizes the atomistic aspects of fracture and is complementary to Theoretical and Applied Mechanics 324. Prerequisite: Theoretical and Applied Mechanics 224 or Metallurgical Engineering 316, or consent of instructor. 3 hours, or 3/4 or 1 unit.
318. **Physics of Metals.** The nature of the perfect and imperfect crystal, the electronic structure of solids, electrical conduction in metals and semiconductors, and dielectric

and magnetic properties of solids. Prerequisite: Senior standing in engineering or consent of instructor. 3 hours or 3/4 unit.

334. **Physical Metallurgy for Engineers.** Fundamentals of crystallography, imperfections, alloying, and deformation; consideration of composition, temperature, and prior thermal and mechanical treatment in the use of metals, with emphasis on their mechanical properties. Prerequisite: Credit or concurrent registration in Theoretical and Applied Mechanics 221 or Aeronautical and Astronautical Engineering 224, or consent of instructor. 3 hours, or 3/4 or 1 unit.
370. **Physical Metallurgy, I.** First of a two-semester sequence treating metallurgical phenomena and their utilization in engineering materials and processes; defects, diffusion, phase diagrams, solidification and casting, and plastic deformation and annealing. Prerequisite: Junior standing in engineering; Mathematics 345; Theoretical and Applied Mechanics 221. 3 hours or 3/4 unit.
371. **Physical Metallurgy Laboratory, I.** Laboratory course to be taken simultaneously with Metallurgical Engineering 370. Experiments using various metallographic, physical, and mechanical property observations to relate structure to properties and illustrate behavior of materials. Prerequisite: Concurrent registration in Metallurgical Engineering 370. 3 hours or 1 unit.
372. **Physical Metallurgy, II.** Continuation of Metallurgical Engineering 370. Precipitation; eutectoid reactions; martensite; ordering; surface reactions; cast iron; and joining. Prerequisite: Metallurgical Engineering 370 or consent of instructor. 3 hours or 3/4 unit.
373. **Physical Metallurgy Laboratory, II.** Laboratory course to be taken simultaneously with Metallurgical Engineering 372. Experiments using various metallographic, physical, and mechanical property observations to relate structure to properties and illustrate behavior of materials. Prerequisite: Concurrent registration in Metallurgical Engineering 372. 3 hours or 1 unit.
375. **Introduction to Polymers.** Fundamentals of polymer science and engineering; polymer chain structure and statistics; polymerization mechanisms and kinetics; molecular weight distributions; rheological and mechanical properties of amorphous polymers; the glassy state; crystalline morphology, mechanisms and kinetics of polymer crystallization, and mechanical behavior of crystalline polymers; methods of fabrication; and solution properties. Prerequisite: Advanced undergraduate or graduate standing. 3 hours, or 3/4 or 1 unit.
376. **The Amorphous State of Polymers.** Fundamental concepts of amorphous, disordered polymer systems; topics include chain statistics, rubber elasticity, polymer solutions, the glassy state, polymer flow properties, colloidal stabilization, polymer adsorption, block copolymers, and scaling concepts. Prerequisite: Metallurgical Engineering 375 and an undergraduate-level course covering classical thermodynamics, or consent of instructor. 3 hours or 1 unit.
378. **Polymer Characterization Laboratory.** Characterizes polymeric materials experimentally to investigate molecular, microstructural and macroscopic aspects of their mechanical, thermal, electrical, and optical properties. Prerequisite: Metallurgical Engineering 375 or consent of instructor. 3 hours, or 3/4 or 1 unit.
386. **Electron Microscopy and Diffraction Theory.** Theory and application of transmission electron microscopy and diffraction with emphasis on thin crystals; electron optics, interference phenomena, interpretation of images and diffraction patterns, specimen preparation, etc. Prerequisite: Metallurgical Engineering 310 or equivalent. 3 hours or 1 unit.
387. **Advanced Physical Metallurgy.** Advanced physical metallurgy designed for graduate students whose undergraduate degrees are in engineering or physical science fields other than metallurgy or materials sciences; discusses the standard topics of physical metallurgy with an emphasis on underlying physical principles; and includes selected laboratory experiments. Not to be taken by undergraduates registered in the Department of Metallurgy and Mining Engineering. Students may not receive credit for Metallurgical Engineering 387, and Metallurgical Engineering

- 370 or 372. Prerequisite: Advanced undergraduate standing in a field other than metallurgy, or graduate standing. 4 hours or 1 unit.
389. **Transport Phenomena in Metals Processing.** Same as Mechanical Engineering 389. Fundamentals of control of shape, structure, and properties of metals through processing; fundamentals of heat flow, fluid flow, and mass transport applied to metals processing; and consideration of such processes as thermal treatments, solidification, vapor deposition, and powder processing and consolidation. Prerequisite: Metallurgical Engineering 370; Mechanical Engineering 234 or consent of instructor. 3 hours, or 3/4 or 1 unit.
401. **Defects and Plastic Deformation in Metals.** Studies point, line, and surface defects in metals; configuration, thermodynamics, and motion; quantitative description of single dislocation properties; and interactions among defects. For students in metallurgy, ceramics, physics, and other solid state sciences. Prerequisite: Mathematics 345 and Metallurgical Engineering 316 and 318; or consent of instructor. 1 unit.
407. **Plastic Deformation and Annealing of Metals.** The mechanism and crystallography of plastic deformation of single crystals and of polycrystalline metals; annealing effects; recovery, subgrain growth, and recrystallization; and deformation textures and annealing textures. Prerequisite: Consent of instructor. 1 unit.
408. **Dislocations and Mechanical Properties of Metals.** General static and dynamic properties of single dislocations in crystals; dislocation interactions; properties of dislocation arrays; and role of dislocations in metallurgical phenomena with particular emphasis on mechanical properties. Prerequisite: Consent of instructor. 1 unit.
409. **Crystal Physics.** The anisotropic properties of crystals treated by tensor and matrix methods with application to paramagnetism, conduction and diffusion, thermoelectricity, deformation, elasticity, and martensitic transformations; discussion of the effects of crystal symmetry and the properties of aggregates. Prerequisite: Vector algebra, determinants, and thermodynamics; consent of instructor. 1 unit.
410. **Advanced X-Ray Metallography.** X-ray diffraction as applied to the study of metals and alloys; effects of cold work, annealing, substructures, preferred orientation, and ordering; and principles of electron and neutron diffraction. Prerequisite: Consent of instructor. 1 unit.
420. **Metallurgical Thermodynamics.** Fundamental thermodynamic considerations and applications of thermodynamics to metallurgical problems; particular emphasis on heterogeneous equilibrium and thermodynamic properties of solutions. Topics approached from the viewpoints of both macroscopic thermodynamics and statistical mechanics. Prerequisite: Metallurgical Engineering 314 or equivalent. 1 unit.
421. **Kinetics of Phase Changes in Metals.** The viewpoint of statistical thermodynamics, rate theory, diffusion in solids, interface energy, nucleation theories, and phenomenological analysis of nucleation and growth; application to crystal growth, diffusionless phase changes, oxidation, pearlite reaction, precipitation, and sintering. Prerequisite: Metallurgical Engineering 420 or consent of instructor. 1 unit.
430. **Surface Physics.** Same as Physics 430. Introduction to theory and experiment of atomic behavior on crystal surfaces; thermodynamics of surfaces; surface energy; diffraction and structure; gas-solid collisions; Brownian motion, diffusion, and evaporation; electron and ion emission, tunnelling; Van der Waals forces; theory of chemical interactions; and kinetics and statistics of adsorption. Prerequisite: Metallurgical Engineering 421 or Physics 489, or consent of instructor. 1 unit.
452. **Solidification Processing.** Same as Mechanical Engineering 452. See Mechanical Engineering 452.
485. **Metallurgical Engineering Problems.** Individual study in areas of metallurgy not covered by regular course offerings; carried out under the supervision of a member of the faculty. Prerequisite: Consent of instructor. 1/4 to 2 units.
486. **Laboratory Investigations in Metallurgy.** Special investigations in metallurgy providing an opportunity for instruction in experimental methods of research.

Available only to nonthesis students enrolled in a Master of Science program.
Prerequisite: Consent of instructor. 1/4 or 1/2 unit.

- 492. **Research Seminars.** Discussion and lectures on current research topics. 0 or 1/4 unit. May be repeated each semester.
- 498. **Colloquium in Physical Metallurgy.** Review of current metallurgical research in other laboratories by visiting lecturers. Some of the research currently done in the department is also reviewed. Required of all graduate students in metallurgical engineering. No credit.
- 499. **Thesis Research.** Individual research in specialized problems under the supervision of members of the staff. Results of research may be used for graduate thesis. 0 to 4 units

Mining Engineering

- 302. **Political, Economic, and Environmental Aspects of Minerals and Their Utilization.** The availability and utilization of national and world mineral resources and the related environmental, economic, and political implications are examined through lectures, readings, student reports, panel discussions, guest speakers, field trips, and films. Prerequisite: Economics 101 or consent of instructor. 3 hours, or 3/4 or 1 unit.
- 351. **Geophysical Prospecting.** Same as Geology 351. Principles of geophysics and their application to mining processes. Prerequisite: Senior standing in engineering or geology, or consent of instructor. 3 hours, or 3/4 or 1 unit.
- 356. **Rock Mechanics.** Mechanical properties of rocks; design of mine openings in bedded, massive, and fractured rock; methods of support; drilling; and blasting. Prerequisite: Mining Engineering 351. 3 hours, or 3/4 or 1 unit.
- 393. **Special Problems.** Individual studies of any phase of mining or petroleum engineering selected by the student and approved by his adviser and the staff member who supervises the study. Prerequisite: Consent of instructor. 0 to 4 hours, or 0 to 1 unit.
- 414. **Physical Chemistry of Clays and Soils.** Same as Soils and Ceramic Engineering 414. See Soils 414.
- 497. **Special Problems.** Individual studies in areas of mining or petroleum engineering not covered by regular course offerings; carried out under the supervision of a member of the staff. Prerequisite: Consent of instructor. 0 to 2 units.
- 499. **Thesis Research.** Individual research in some phase of the general field of mining or petroleum engineering under the supervision of a member of the staff. 0 to 4 units

MICROBIOLOGY

Head of Department: Professor R. D. DeMoss

Department Office: 131 Burrill Hall, 407 S. Goodwin, Urbana

- 100. **Introductory Microbiology.** Introduction to the principal activities and properties of microorganisms, including bacteria, yeasts, molds, and viruses; consideration of the role of natural processes, such as photosynthesis; and man's use and control of microorganisms in the production of antibodies and vaccines in industrial fermentations, in sanitation and public health, and in agriculture. Not recommended for satisfaction of general education requirement. There are no prerequisites for Microbiology 100, but some chemistry is recommended. 3 hours. Credit is not given for more than one of the following: Microbiology 100, 113, or 200.
- 101. **Introductory Experimental Microbiology.** Laboratory introduction to the techniques employed in the investigation of microbial activities and properties; experiments designed to familiarize the student with the handling, identification, and

- characterization of microorganisms and their activities, particularly those of interest to man. Prerequisite: Credit or concurrent registration in Microbiology 100. 2 hours. Credit is not given for both Microbiology 101 and 201.
113. **Man and Microbes.** General education biological science course for nonscience majors; examines the effects of microbes on the activities of man; emphasizes environmental, economic, and disease effects of microbial activity on society; and presents microbiology as an example of a modern biological science. 3 hours. Credit is not given for more than one of the following: Microbiology 113, 200, or 100.
200. **Microbiology.** Emphasis on fundamental concepts of microbiology, including nutrition, ecology, and physiology of microorganisms, and their role in nature and in infection and immunity. Prerequisite: Credit or concurrent registration in organic chemistry. 3 hours. Credit is not given for more than one of the following: Microbiology 200, 100, or 113.
201. **Experimental Microbiology.** Laboratory emphasizing the fundamentals of microbiology, including the biochemical basis of microbial physiology, ecology, and nutrition; microbial genetics and gene-enzyme relationships. Emphasis and encouragement are given to the experimental approach to microbiology. Prerequisite: Credit or concurrent registration in Microbiology 200 and in organic chemistry. 3 to 5 hours. Credit is not given for both Microbiology 201 and 101.
290. **Research and Special Problems.** Prerequisite: Fifteen hours of microbiology; consent of instructor. 3 to 5 hours. May be repeated for a maximum of 10 hours.
292. **Senior Thesis.** Research under the direction of a senior staff member in microbiology. Normally, the student takes two semesters of Microbiology 292 in the senior year. Recommended for all those planning future research and graduate study; prerequisite for graduation with distinction in microbiology. In the semester preceding initial enrollment, interested students should consult with their advisors concerning the procedures for enrollment. A minimum of 2 hours per senior semester is required, and a thesis must be presented for credit to be received, but graduation with distinction is not an automatic result of enrollment in Microbiology 292. Prerequisite: Consent of senior thesis adviser. 2 to 6 hours. May be repeated for a maximum of 10 hours.
309. **Comparative Microbial Chemistry.** Emphasis on comparative biochemical activity and other chemical characteristics as a basis for discussion of the features of major groups of microorganisms; stress on comparison of the energy metabolism of microbial groups. Prerequisite: Biochemistry 350 or equivalent. 2 hours or 1/2 unit.
311. **Food and Industrial Microbiology.** Relationship of microorganisms to food manufacture and preservation, to industrial fermentation and processing, and to sanitation. Prerequisite: Microbiology 101 or 201 or equivalent; credit or concurrent registration in organic chemistry laboratory, or consent of instructor. 3 hours or 3/4 unit.
312. **Techniques of Applied Microbiology.** Consideration, through experimentation, of properties of bacteria, yeasts, molds, and actinomycetes important to industrial processes; exploration of methods of control of microbial processes in industry and sanitation. Prerequisite: Credit or concurrent registration in Microbiology 311, and consent of instructor. 2 hours or 1/2 unit.
316. **Genetic Analysis of Microorganisms.** Prokaryotic and eukaryotic microbial genetic systems; emphasis on typical data analyses, together with the basic classes of genetic phenomena. Prerequisite: General genetics, Microbiology 200, or Microbiology 330. 3 hours or 3/4 unit.
317. **Experimental Techniques in Molecular Biology.** Laboratory emphasizing current molecular biology techniques. Topics include genetic techniques, isolation and characterization of transposons, genetic regulation, in vitro transcription, restriction endonuclease mapping, cloning, and DNA sequencing. Prerequisite: Microbiology 201, 316 and 330, Biochemistry 355, and consent of instructor. 2 hours or 1/2 unit.
326. **Biology of Bacterial Pathogens.** Emphasizes prokaryotes that cause important diseases in humans and other animals; host-parasite bacteriology; and chemistry and genetics of mechanisms of pathogenesis. Prerequisite: Microbiology 100, 200, or 309;

- organic chemistry or consent of instructor. Biochemistry is recommended. 3 hours or 3/4 unit.
327. **Immunochemistry.** Survey of the field of immunology with emphasis on its chemical aspects. Lectures and laboratory. Prerequisite: Credit or concurrent registration in biochemistry, and consent of instructor. 5 hours or 1 unit.
328. **Properties of Bacterial Pathogens.** Laboratory study of methods of recognition and differentiation, diagnostic tests, and mechanisms of pathogenesis; students are voluntary donors of microorganisms used in experiments. Prerequisite: Microbiology 101, 201, or 409; credit or registration in Microbiology 326 or consent of instructor. 2 hours or 1/2 unit.
330. **Molecular Biology of Microorganisms.** Modern contributions to the science of microbiology; emphasis on the structure, function, and synthesis of informational macromolecules and on the role microorganisms have played in molecular biology. Prerequisite: Microbiology 200 or equivalent; credit or concurrent registration in biochemistry. 3 hours or 3/4 unit.
331. **Microbial Physiology.** Examines bacterial physiology, including discussions of energetics, regulation of metabolism, and cell structure. Prerequisite: Microbiology 200 or equivalent; credit or concurrent registration in biochemistry. 3 hours or 3/4 unit.
336. **Mechanisms of Pathogenesis.** The dynamic interactions between microbial parasites and their hosts; ranges from clinical to molecular aspects of infectious disease; and emphasizes established and potential mechanisms of pathogenesis. Prerequisite: Microbiology 326 or consent of instructor. 2 hours or 1/2 unit.
351. **Viruses.** Same as Botany 351. Introduces the molecular basis of virus structure, replication, genetics, infection, and virus- host interactions; discusses also animal viruses as agents of disease and their role in epidemics and persistent infections. Prerequisite: Credit or concurrent registration in Microbiology 330 or Biochemistry 350; or consent of instructor. 3 hours or 3/4 unit.
409. **Cultivation and Properties of Microorganisms.** Nutritional and metabolic properties of the major groups of microorganisms; a comparative study of the ecology, selective isolation, and cultivation of bacteria. Laboratory. Prerequisite: Biochemistry 355 or equivalent; credit or concurrent registration in Microbiology 309; consent of instructor. 1 unit.
412. **Advances in Microbiology.** Discussions of current research in the following areas of microbiology: (a) general microbiology; (b) microbial physiology and metabolism; (c) immunochemistry; and (d) molecular genetics. Prerequisite: Consent of instructor. 1/4 unit. May be repeated for a maximum of 1 unit.
419. **Animal Virology.** Same as Veterinary Pathobiology 419. See Veterinary Pathobiology 419.
485. **Topics in Microbiology and Molecular Biology.** Discussions, reviews, and appraisal of special topics in microbiology and molecular biology; seminar or lecture. Topics do not repeat. Prerequisite: Consent of instructor. 1/4 unit. May be repeated to a maximum of 2 units.
490. **Individual Problems.** Prerequisite: Consent of instructor. 1/2 to 4 units.
491. **Experimental Methods.** Laboratory research methods; familiarization of first-year graduate students with experimental methods used for research in microbiology. Required of all first-year students majoring in microbiology. First seven weeks of each semester. Prerequisite: First-year graduate status and consent of department; concurrent registration in Microbiology 492. 1/4 unit. May be repeated to a maximum of 1/2 unit.
492. **Experimental Methods.** Laboratory research methods; familiarization of first-year graduate students with experimental methods used for research in microbiology. Required of all first-year students majoring in microbiology. Second seven weeks of each semester. Prerequisite: First-year graduate status and consent of department; concurrent registration in Microbiology 491. 1/4 unit. May be repeated to a maximum of 1/2 unit.

495. **Seminar.** Required of all graduate students whose major is microbiology. Prerequisite: Ten hours of microbiology; consent of instructor. 0 or 1/4 unit.
499. **Thesis Research.** 0 to 4 units

MILITARY SCIENCE

Head of Department: Lieutenant Colonel R. Poshard

Department Office: 111 Armory Building, 505 East Armory, Champaign

100. **Leadership Laboratory.** A noncredit course designed to provide development by practical application of the student's leadership characteristics through progressive training in leadership, drill, and command. 0 credit.
101. **Introduction to Military Science.** An introduction to the organization, mission, and functions of the Army; includes military life and customs and introduction to United States Defense Establishment. 1 hour.
102. **Land Navigation.** Fundamentals of military and USGS map reading; includes the application of basic land navigation principles as applied to military maps and an introduction to the sport of orienteering utilizing the military and silva compass. Field trips may be required. 1 hour.
103. **Introduction to Tactics.** Fundamentals of tactics and their application to the employment of squad- and platoon-sized units in offensive and defensive military operations. 1 hour.
112. **American Military History.** Develops certain basic concepts useful for the study of current problems of national defense; gives the student a sense of perspective and continuity of the main developments in the history of warfare, and the relation of war to society; discussions of land, sea, and air war through an examination of the relation of strategy and tactics to geography, economics, sociology, and technology through the ages; analyzes the relationship between civilians and soldiers in various forms of government; surveys main developments in the history of warfare as they have affected American military history; and examines the effects of nuclear weapons on traditional concepts. 2 hours.
125. **Leadership Laboratory.** A noncredit course designed to provide development by practical application of the student's leadership characteristics through progressive training in leadership, drill, and command. 0 credit.
150. **Leadership Laboratory.** A noncredit course designed to provide development by practical application of the student's leadership characteristics through progressive training in leadership, drill, and command. 0 credit.
175. **Leadership Laboratory.** A noncredit course designed to provide development by practical application of the student's leadership characteristics through progressive training in leadership, drill, and command. 0 credit.
200. **Leadership Laboratory.** A noncredit course designed to provide development by practical application of the student's leadership characteristics through progressive training in leadership, drill, and command. 0 credit.
201. **Fundamentals of Learning and Military Instruction.** An introduction to the fundamentals of learning, including theories of learning, the learning process, and teaching techniques; principles of military instruction with respect to methods in and support of the instruction phase and follow-on evaluation; and an overview of military briefings, facilities, and resources available to the military teacher/trainer. 1 hour.
202. **Introductory Military Operations.** The application of the principles of offensive and defensive combat as applied to small tactical units; an analysis of the problem of insurgency and the methods used in its containment; and the means and methods of military communications and their use. Prerequisite: Registration in the AROTC advance course. 3 hours.

203. **Principles of Military Leadership.** Introduces the student to the principles of leadership, the responsibilities and techniques of military leaders, and the problems of leadership in the military environment. Prerequisite: Registration in the AROTC advance course. 2 hours.
211. **Proseminar.** A lecture-discussion course utilizing guest lectures in politico-military and military affairs; an introduction to the fundamental concepts of military justice; the basic principles and methods of courts martial procedures; and the principles of nonjudicial punishment. Prerequisite: Registration in the AROTC advance course. 2 hours.
225. **Leadership Laboratory.** A noncredit course designed to provide development by practical application of the student's leadership characteristics through progressive training in leadership, drill, and command. 0 credit.
250. **Leadership Laboratory.** A noncredit course designed to provide development by practical application of the student's leadership characteristics through progressive training in leadership, drill, and command. 0 credit.
275. **Leadership Laboratory.** A noncredit course designed to provide development by practical application of the student's leadership characteristics through progressive training in leadership, drill, and command. 0 credit.
288. **National Defense Policy.** Development of the military as a part of society; includes origins of the interaction between the military and politics, various military sociological models, the military and modernization, and the military and national security. Prerequisite: Registration in the AROTC advance course. 3 hours

MINING ENGINEERING

(See Metallurgy and Mining Engineering)

MUSIC

Director of School: Professor R. E. Bays

School Office: 3054 Music Building, 1114 W. Nevada, Urbana

100. **Rudiments of Theory.** An introductory course for nonmajors which stresses the acquisition and understanding of aural and written aspects of tonal music. 3 hours.
101. **Fundamentals of Music Theory and Practice, I.** Notation, vocabulary, and basic concepts, including scales, modes, intervals, chords, and terminology; aural and visual analysis of musical forms and procedures; and stresses the development of melodic, harmonic, and rhythmic vocabularies. Prerequisite: Music 100 or placement into Music 101 by examination. 3 hours.
102. **Fundamentals of Music Theory and Practice, II.** A continuation of Music 101 with gradually increased emphasis on visual elements (score reading and analysis); links theory and practice through analytical understanding. Prerequisite: Music 101. 3 hours.
103. **Fundamentals of Music Theory and Practice, III.** Continuation of Music 102 with gradually increased emphasis on contrapuntal techniques, dissonance in tonal music, and musical form. Prerequisite: Music 102 and 107. 3 hours.
104. **Fundamentals of Music Theory and Practice, IV.** Continuation of Music 103 with emphasis on late tonal chromaticism; introduction to serial techniques, nontonal centricity, cellular structure, twentieth-century rhythmic techniques, and noise and indeterminacy. Prerequisite: Music 103 and 108. 3 hours.
106. **Beginning Composition.** Music composition in its beginning stages; practice in phrase, section, and short form construction, analysis, and writing; instruction in

- range, characteristics, and idiom of instruments and voices. Prerequisite: Consent of instructor. 2 hours. May be repeated to a maximum of 6 hours.
107. **Aural Skills, I.** Practice in developing basic reading, notating, and listening skills in rhythmic, melodic, contrapuntal, harmonic, and formal aspects of musical structure; emphasizes diatonic tonal pitch structures. Prerequisite: Music 101 or placement by examination. 1 hour.
108. **Aural Skills, II.** Continuation of Music 107 with emphasis on extensions of tonality by means of changing tonal centers and altered chords. Prerequisite: Music 107 or placement by examination. 1 hour.
109. **Aural Skills, III.** Continuation of Music 108 with emphasis on atonal pitch structures. Prerequisite: Music 108. 1 hour.
110. **Basic Music Literature.** An introduction to the standard concert repertory through intensive guided listening. Representative works by major composers are chosen to illustrate the principal forms, styles, and techniques of vocal and instrumental music emphasizing the period since 1700. Required of freshmen in music. 2 hours.
113. **Appreciation of Music.** Symphonic poems and symphonies. For nonmusic students. Prerequisite: Sophomore standing. 2 hours.
115. **Introduction to Opera.** Introduction to the art form, opera; a survey of its musical and dramatic development from 1600 to the present. Prerequisite: Sophomore standing. 2 hours.
130. **Introduction to the Art of Music, I.** Designed for the layman to train students in intelligent listening and to acquaint them with many great works of the literature of music. For nonmusic students only. Students register for the lecture and one quiz section. 4 hours.
131. **Introduction to the Art of Music, II.** Continuation of Music 130. For nonmusic students only. Prerequisite: Music 130. 4 hours.
133. **Introduction to World Music.** A survey of the musics of Asia, Africa, and Oceania and the native traditions of the Americas. 3 hours.
140. **Introduction to Music Education.** Basic issues and principles of music education and the teaching profession; includes 16 clock hours of required early field experiences in the teaching of music. 2 hours.
142. **Elements of Conducting.** Fundamentals of conducting, score preparation, and transcription for choral and instrumental ensembles. 2 hours.
143. **Pre-Student Teaching Experience.** Early field experience in teacher education, including a practicum of observation, teacher aide, and teaching experiences in music. Thirty-two clock hours of early field experience is required for each 1 hour of credit. 1 or 2 hours. May be repeated to a maximum of 4 hours; only 2 hours may be applied toward the degree.
144. **Music Teaching Technique Laboratory.** Class and individual instruction on musical instruments and voice for non-music majors; serves as a laboratory for undergraduate music education students to teach in major music field. 2 hours. May be repeated to a maximum of 6 hours.
150. **Jazz Piano Improvisation, I.** The study of jazz theory, harmony, and improvisational techniques at the piano; includes experience in solo and ensemble situations, and an historical survey of jazz development from about 1910. Prerequisite: Music 162 or equivalent; Music 104 and 109, or equivalent; consent of instructor. 2 hours.
151. **Jazz Piano Improvisation, II.** Continuation of Music 150. The study of jazz theory, harmony, and improvisational techniques at the piano; includes experience in solo and ensemble situations, and an historical survey of jazz development from about 1910. Prerequisite: Music 150 or consent of instructor. 2 hours.
160. **Group Instruction in Piano, I.** Beginning group instruction in piano for music majors whose principal performing medium is voice or an orchestral or band instrument; studies simple piano literature and the development of skills in technique, sight reading, harmonization, transposition, improvisation, and analysis. 2 hours.

161. **Group Instruction in Piano, II.** Elementary group instruction in piano for music majors whose principal performing medium is voice or an orchestral or band instrument; easy solos from the main periods with appropriate technical development; continuation of skills introduced in Music 160; and introduction of piano ensemble literature. Prerequisite: Music 160 or equivalent; consent of instructor. 2 hours.
162. **Group Instruction in Piano, III.** Intermediate group instruction in piano for music majors whose main performing medium is voice or an orchestral or band instrument; study of intermediate level solos and ensemble compositions; harmonization with chromatic chords, sight reading, transposition of four-voice works, improvisation, and learning of patriotic songs. Prerequisite: Music 161 or equivalent; consent of instructor. 2 hours.
163. **Group Instruction in Piano, IV.** Moderately advanced group instruction in piano for music majors whose performing medium is voice or an orchestral or band instrument; continuation of Music 162 with emphasis on solos, ensemble works, technical development, and more advanced work in sight reading, harmonization, improvisation, transposition, and aural skills. 2 hours.
165. **Class Instruction in Voice.** Group instruction in the fundamentals of singing. For School of Music students who do not major in voice; required of such students in music education. 2 hours.
166. **English Diction.** Phonetics applied to English song literature; individual clinical analysis and practice. To be taken with Music 181. Prerequisite: Freshman standing in voice or consent of instructor. 1 hour.
167. **Italian Diction.** Phonetics applied to Italian song literature; individual clinical analysis and practice. To be taken with Music 181. Prerequisite: Freshman standing in voice or consent of instructor. 1 hour.
168. **German Diction.** German pronunciation as applied to German vocal literature; class and individual clinical analysis and practice. To be taken with Music 181. Prerequisite: Sophomore standing in voice or consent of instructor. 1 hour.
169. **French Diction.** Principles of French pronunciation applied to French vocal literature; class and individual clinical analysis and practice. To be taken with Music 181. Prerequisite: Sophomore standing in voice or consent of instructor. 1 hour.
170. **String Instruments.** Class instruction in the fundamentals of playing violin, viola, cello, and string bass. Prerequisite: Enrollment in the School of Music; for nonmusic majors, consent of instructor. 2 hours.
171. **Woodwind Instruments.** Class instruction in the fundamentals of playing and teaching clarinet, flute, saxophone, oboe, and bassoon. Prerequisite: Enrollment in the School of Music; for nonmusic majors, consent of instructor. 1/2 or 2 hours.
172. **Brass Instruments.** Class instruction in the fundamentals of playing and teaching trumpet, French horn, trombone, euphonium, and tuba. Prerequisite: Enrollment in the School of Music; for nonmusic majors, consent of instructor. 1/2 or 2 hours.
173. **Percussion Instruments.** Class instruction in the fundamentals of playing and teaching percussion instruments. Prerequisite: Enrollment in the School of Music; for non majors, consent of instructor. 2 hours.
174. **Guitar Techniques.** Techniques of playing and teaching classic and folk guitar. Prerequisite: Consent of instructor. 2 hours.
175. **Techniques of Teaching Classroom Instruments.** Fundamental techniques for playing the guitar, the recorder, and the autoharp; includes methods for implementing the use of these instruments in the teaching of elementary and junior high school vocal-music classes. 2 hours.
178. **Guitar.** Instruction in guitar at the undergraduate level, predominantly classical. 2 or 4 hours (summer session, 1 or 2 hours).
179. **Harpsichord.** Instruction in harpsichord at the undergraduate level. 2 or 4 hours.
180. **Piano.** Instruction in piano at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
181. **Voice.** Instruction in singing at the undergraduate level. 2 or 3 hours (summer session, 1 or 2 hours).

182. **Organ.** Instruction in organ at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
183. **Violin.** Instruction in violin at the undergraduate level. 2 or 3 hours (summer session 1 or 2 hours).
184. **Viola.** Instruction in viola at the undergraduate level. 2 or 3 hours (summer session, 1 or 2 hours).
185. **Cello.** Instruction in violoncello at the undergraduate level. 2 or 3 hours (summer session, 1 or 2 hours).
186. **String Bass.** Instruction in string bass at the undergraduate level. 2 or 3 hours (summer session, 1 or 2 hours).
187. **Flute.** Instruction in flute at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
188. **Clarinet.** Instruction in clarinet at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
189. **Oboe.** Instruction in oboe at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
190. **Bassoon.** Instruction in bassoon at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
191. **Cornet and Trumpet.** Instruction in cornet and trumpet at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
192. **French Horn.** Instruction in French horn at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
193. **Trombone.** Instruction in trombone at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
194. **Euphonium.** Instruction in euphonium at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
195. **Tuba.** Instruction in tuba at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
196. **Percussion.** Instruction in percussion at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
197. **Harp.** Instruction in harp at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
198. **Saxophone.** Instruction in saxophone at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Instrumentation, I.** Orchestration and arranging for orchestral groups. Prerequisite: Senior standing in music. 2 hours.
201. **Instrumentation, II.** Problems in arranging for all wind instruments. Required of composition majors. Prerequisite: Music 200 or consent of instructor. 2 hours.
202. **Review of Music Theory.** Fundamental terminology and procedures for analysis of western music; representative works from major stylistic periods, with particular attention to the development of the students' understanding of functional elements and analytical techniques. Students may present no more than 14 hours credit in Music 101, 102, 103, 104, and/or 202 for graduation. Prerequisite: One year of music theory at another institution. 3 hours.
203. **Rudiments of Harmonic Practice.** A course for non-majors which stresses the acquisition and understanding of harmonic materials and the relationships between harmonic and formal aspects of tonal music. Prerequisite: Music 100 or passing of placement test. 3 hours.
204. **Compositional Problems: Serial Techniques.** Studies serial techniques and levels of determinacy through composition and analysis. Prerequisite: Consent of composition/theory faculty. 2 hours.
205. **Compositional Problems: Technological and Visual Aspects.** Studies electronic and computer applications, visual and gestural elements, and levels of determinacy through composition and analysis. Prerequisite: Consent of composition/theory faculty. 2 hours.

- 206. Intermediate Composition.** Music composition at the secondary stages, including analysis and writing of shorter musical forms. Prerequisite: Music 106 and consent of composition/theory faculty. 2 hours. May be repeated to a maximum of 6 hours.
- 209. Kodaly: Philosophy and Methods.** An introduction to the music education philosophy of Zoltan Kodaly through experiences in relative sol-fa and the expansion of aural awareness. Prerequisite: Consent of instructor. 2 hours.
- 210. Computer-Assisted Instruction in Music.** Introduction to computer-assisted instruction (CAI) and its uses in public school, college, and continuing education programs in music; familiarization with visual and audio programming strategies and the research potential of CAI systems. Prerequisite: Consent of instructor. 2 hours.
- 213. The History of Music, I.** Survey of music and its development in Western civilization to 1750; emphasis on an acquaintance with representative musical works and style, and on understanding musical concepts in the light of their historical background. Required of all music students. Prerequisite: Music 110 or consent of instructor. 3 hours.
- 214. The History of Music, II.** Survey of the development of music as an art in Western civilization from 1750 to the present; emphasis on an acquaintance with formal and stylistic problems through the study of representative works and on understanding specific musical concepts in the light of their historical and general cultural context. Required of all music students. Prerequisite: Music 213. 3 hours.
- 229. Thesis and Advanced Undergraduate Honors in Music.** Special individual research projects. Required of seniors in the history of music and composition-theory curricula; open also to advanced undergraduates, including James Scholars, who have achieved University or college honors and who desire to do research in specialized areas of music, including performance. Prerequisite: Senior standing in the history of music and composition-theory, or consent of instructor. 2 hours.
- 230. Choral Literature and Conducting, I.** A laboratory course which includes choral literature for secondary choral groups. Students conduct choral singing groups (their conducting is videotaped), learn to analyze and prepare choral scores, and conduct in a choral laboratory. Prerequisite: Music 142. 2 hours.
- 231. Choral Literature and Conducting, II.** A laboratory course which includes the study and conducting of public school choral music. Students conduct choral groups, prepare choral scores, learn rehearsal techniques, conduct in a choral laboratory, and conduct vocal ensembles in the public schools. Prerequisite: Music 230. 2 hours.
- 232. Instrumental Literature and Conducting, I.** Survey of music literature for wind ensemble and band; principles of interpretation and techniques of conducting emphasized through detailed study and performance of selected compositions. Prerequisite: Music 142. 3 hours.
- 233. Instrumental Literature and Conducting, II.** Principles of interpretation and techniques of orchestral conducting emphasized through detailed study and performance of selected orchestral compositions appropriate for public school groups. Prerequisite: Music 232. 3 hours.
- 234. Workshop in Elementary Music Education.** Detailed consideration of music objectives, principles of learning, and their implications for teaching methods; major emphasis on techniques and materials suitable for teaching music in the elementary school by the classroom teacher. Specifically designed for the experienced classroom teacher. Prerequisite: Consent of instructor; public school teaching experience. 2 hours. Offered in the summer session only.
- 235. Elementary and Junior High School Instrumental Music.** Principles, materials, and pedagogical and organizational techniques for teaching instrumental music in the elementary and junior high school. 2 hours.
- 236. Choral Techniques in Elementary and Junior High School.** A detailed consideration of literature, arranging for elementary and junior high school choruses, and the changing voice. Prerequisite: Advanced music undergraduate standing or consent of instructor. 3 hours.

237. **Orff: Philosophy and Methods.** An introduction to the Carl Orff-Schulwerk approach to music for children; techniques include the use of Orff instruments and materials and the adaptation of these materials for classroom use with or without instruments. Prerequisite: Sophomore standing in music education or consent of instructor. 2 hours.
239. **Principles and Techniques in Music Education.** A comprehensive examination of interrelationships among the various segments of music education; the role of music education at all levels in the total school program, elementary through secondary, with emphasis upon philosophy, learning theory, curriculum design and engineering, administration, and current trends. Includes 20 clock hours of required early field experiences in the teaching of music. Prerequisite: Senior standing in music education or consent of instructor, plus 80 hours of early field experiences in the teaching of music. 3 hours.
240. **Music for Elementary Teachers, I.** A presentation of music for students preparing to teach in the elementary schools. Prerequisite: Junior standing in elementary education or consent of instructor. 3 hours.
241. **Music for Elementary Teachers, II.** Continuation of Music 240. A presentation of music for students preparing to teach in the elementary schools. Prerequisite: Music 240 or consent of instructor. 3 hours.
242. **Teaching Music in the Elementary School.** Techniques of and material suitable for teaching music in the elementary school. 3 hours.
243. **Teaching Music in the Junior High School.** Detailed consideration of the music program in the junior high school; special emphasis on instructional material and methods of instruction. 3 hours.
244. **Teaching of Instrumental Music.** Organizing and rehearsing school marching and jazz bands; techniques of administering and publicizing school instrumental music programs. Prerequisite: Music 232. 3 hours.
245. **Choral Score Preparation.** Detailed consideration of the techniques of choral music analysis and score preparation for performance; includes stylistic considerations and effective programming. Prerequisite: Music 142, 230, or 231, or consent of instructor. 2 hours.
246. **Teaching of Choral Music.** A methods course designed for junior and senior high school vocal and choral majors; includes rehearsal management, choral style, and materials suitable for organizing and teaching choral music in the public schools. Prerequisite: Music 142, 230, 231, or consent of instructor. 3 hours.
247. **Repertory for the Secondary School Choral Program.** An exploration of literature appropriate for public school music groups through demonstrative rehearsals and public performances. Prerequisite: Music 142, 230, 231, or consent of instructor. 1 or 2 hours. May be repeated to a maximum of 6 hours.
249. **Music for Early Childhood Teachers.** Development of musical competencies essential for teachers in nursery schools and kindergartens; singing, rhythmic keyboard improvisation, and creative and music reading skills; and extensive study of music materials suitable for use in early childhood music. Prerequisite: Music 240 or consent of instructor. 3 hours.
250. **University Orchestra.** Prerequisite: Consent of instructor. 1 hour.
251. **Chamber Orchestra.** A chamber orchestra for the purpose of performing literature of all periods written specifically for a chamber-sized orchestra. Prerequisite: Consent of instructor. 1 hour.
252. **Wind Ensemble.** Mixed woodwind-brass-percussion ensembles for the study and performance of wind chamber compositions. Prerequisite: Junior standing or consent of instructor. 1 hour.
253. **Collegium Musicum.** Ensemble work in the performance of medieval, Renaissance, and baroque music; various small groups formed for the performance of sonatas and cantatas of Bach and Handel, wind serenades of Mozart, etc. Interested students may play on viola, lute, harpsichord, and other instruments from the University's collection. Prerequisite: Consent of instructor. 1 hour.

254. **String Ensemble.** The student participates in various ensemble groups, such as trios, quartets, quintets, etc., for the study of chamber music literature. The course may be repeated or taken during the freshman and sophomore year without credit. Prerequisite: Consent of instructor. 1 hour.
255. **Woodwind Ensemble.** Prerequisite: Consent of instructor. 1 hour.
256. **Brass Ensemble.** Ensembles of mixed brasses in both small and large forms. Prerequisite: Consent of instructor. 1 hour.
257. **Percussion Ensemble.** Prerequisite: Consent of instructor. 1 hour.
258. **Piano Ensemble.** Prerequisite: Consent of instructor. 1 hour.
259. **Organ Keyboard Techniques.** Development of practical keyboard skills related to the work of the church organist; transposition, score-reading, harmonization, modulation, hymn- playing, and solo and anthem accompaniment. Prerequisite: Consent of instructor. 1 hour.
260. **Oratorio Society.** Performance of oratorios and other major choral works in cooperation with the University Symphony Orchestra; an advanced mixed-voice chorus open to students, faculty, and townspeople. Prerequisite: Consent of instructor. 1 hour.
261. **University Chorus.** Performance of cantatas and other choral works; a mixed-voice chorus for average and beginning singers. Open to students, faculty, and townspeople. Prerequisite: Consent of instructor. 1 hour.
262. **Women's Glee Club.** Practical experience in the rehearsal and public performance of choral music of various periods and styles. Open to all women students. Prerequisite: Consent of instructor. 1 hour.
263. **Men's Glee Club.** Practical experience in the rehearsal and public performance of choral music of various periods and styles. Open to all men students. Prerequisite: Consent of instructor. 1 hour.
264. **Concert Choir.** Practical experience in mixed-voice singing of accompanied and unaccompanied music of various periods and styles; a highly advanced group of competent student singers. Prerequisite: Consent of instructor. 1 hour.
265. **Opera-Musical Theatre.** Preparation and public performance of grand or light opera; covers the music and acting only. Students desiring experience in costuming, stage management, scenery, publicity, etc., should apply to the University Theatre which cooperates in the opera productions. Admission is by audition. Prerequisite: Consent of instructor. 1 hour.
266. **Jazz Band.** Designed to acquaint proficient instrumentalists with jazz compositions, arrangements, and improvisational procedures, and to promote a high degree of stylistic and technical competence in performance. Prerequisite: Consent of instructor, determined by auditions. 1 hour.
267. **Harp Ensemble.** Ensembles of multiple harps and harp in combination with other instruments. Prerequisite: Consent of instructor, or Music 197 and/or 397. 1 hour.
268. **Small Choral Ensembles.** Open to a limited number of undergraduate students who desire experience in performance of music specifically written for smaller choral groups. Membership through audition only. Prerequisite: Consent of instructor. 1 hour.
269. **String Chamber Music, Literature, and Performance.** Extensive study of chamber music literature for or including string instruments (violin, viola, cello, double bass); assigns students to chamber groups coached on a weekly basis by members of the string faculty. Requires one performance per semester. Prerequisite: Enrollment in instrumental music curriculum for string instrument majors, or consent of instructor. 1 hour. May be repeated to a maximum of 8 hours.
270. **String Education, I: Teaching of Stringed Instruments at the Elementary Level.** Organization, materials, and techniques. Prerequisite: String major standing or consent of instructor. 3 hours.
271. **String Education, II: Teaching of Stringed Instruments at the Secondary Level.** Organization, materials, and techniques. Prerequisite: Music 270 or consent of instructor. 3 hours.

300. **Counterpoint and Fugue.** The study of contrapuntal writing in the eighteenth century, including fugue, with emphasis on the works of J. S. Bach; involves both writing and analysis. Prerequisite: Music 104 or consent of instructor. 3 hours or 1/2 unit.
302. **Musical Acoustics.** Theory and application of simple resonators, wave motion, resonances of string and pipes; perception of loudness, pitch and timbre; musical scales; and acoustics of rooms and musical instruments. Prerequisite: Mathematics 112 and Music 100, or consent of instructor. 3 hours or 3/4 unit.
304. **Contemporary Compositional Techniques.** Studies in specialized areas of composition for advanced undergraduates and graduates majoring in composition-theory. May be elected by others with consent of instructor. Prerequisite: Music 104, 106, or 109, or consent of instructor. 2 hours or 1/2 unit.
306. **Composition.** Work in original composition including small and large forms. Prerequisite: for undergraduates, Music 204, 205, and 206 and consent of composition faculty; for graduate students, consent of composition faculty. Students submit scores of their compositions to the composition faculty in order to obtain consent to register; consent is granted on the basis of the quality of the music the student has composed and the level of skill demonstrated in the work submitted. 3 hours or 1/2 unit.
307. **Counterpoint of the Fifteenth and Sixteenth Centuries.** Analysis and writing in the principal contrapuntal styles of the fifteenth and sixteenth centuries; familiarization, through study and singing, with the styles of Dunstable, Dufay, Obrecht, Okeghem, Gombert, Des Pres, Lassus and Palestrina; and writing based on the results of the study of these composers' works. Prerequisite: Junior standing in music or consent of instructor. 2 hours or 1/2 unit. Offered in 1975-76 and in alternate years.
308. **Analysis of Musical Form.** An extensive study of the formal structure of representative musical compositions from various historical periods, including Renaissance and Baroque, Viennese Classical, Nineteenth Century, first half of Twentieth Century, and since World War II. Prerequisite: Music 104 and 109. 3 hours or 1/2 unit. May be repeated to a maximum of 9 hours or 1 1/2 unit.
310. **Ancient and Medieval Music.** A history of Western music to about 1400. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or 3/4 unit.
311. **Music in the Renaissance.** A history of music from about 1400 to 1600. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or 3/4 unit.
312. **Music of the Seventeenth Century.** A history of music from about 1600 to 1700. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or 3/4 unit.
313. **Music of the Eighteenth Century.** A history of music from about 1700 to 1800. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or 3/4 unit.
314. **Music of the Nineteenth Century.** A history of music from about 1800 to 1900. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or 3/4 unit.
315. **Music of the Twentieth Century.** A history of music from about 1900 to the present. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or 3/4 unit.
316. **Anthropology of Music.** Same as Anthropology 316. An introduction to the anthropological study of music, including the role of music in the world's societies and nonwestern musical systems and cultures. Prerequisite: Anthropology 103 or 110, or consent of instructor. 3 hours or 3/4 unit.
317. **Area Studies in Ethnomusicology.** Same as Anthropology 315. A seminar devoted to intensive study in the music of one specific culture, e.g., Japan, China, Indonesia, India, the Near East, African and New World Negro, European and American folk cultures, or American Indian. Prerequisite: Senior standing in music or consent of instructor. 3 hours or 3/4 unit. May be repeated to a maximum of 12 hours or 2 units.
318. **History of Performance Practices, I.** Study of musical performance from about 900 to 1650 A.D.; discussion of musical instruments, makeup of instrumental and vocal ensembles, etc., supplemented by demonstration performances of selected works

- using the University's collection of instruments. Prerequisite: Senior standing in music theory and music history, or consent of instructor. 3 hours or 3/4 unit.
319. **History of Performance Practices, II.** Study of musical performance from 1600 to 1750 A.D.; discussion of musical instruments, ornamentation, basso, continuo, etc., supplemented by demonstration performances using the University's collection of instruments. Prerequisite: Senior standing in music theory and music history, or consent of instructor. 3 hours or 3/4 unit.
320. **Proseminar.** Special preparation in specialized fields of musicology, theory and composition, and music education. Prerequisite: Senior or graduate standing in music or music education; consent of instructor. 2 or 4 hours, or 1/2 or 1 unit. May be repeated to a maximum of 8 hours or 2 units. Open Option Students may repeat to a maximum of 16 hours.
321. **Electronic Music Techniques, I.** Introduces electro-acoustic music, including historical background, literature, techniques of notation and realization, and compositional application in the areas of musique concrete, classical electronic music, and voltage-controlled electronic music. Prerequisite: Junior standing in music or consent of instructor. 4 hours or 1 unit.
322. **Electronic Music Techniques, II.** Advanced study in the use of voltage-controlled synthesizers in music composition and study of compositional, technical, and performance considerations in combining electronics with traditional instruments and/or voices in music composition. Prerequisite: Music 321 or placement by examination. 2 hours or 1/2 unit.
323. **Opera Production, I.** Helps interested students on the graduate level study the problems of the lyric stage; investigation of and practice with casting methods, program selection, production procedures, stage direction, coaching methods, and opera dramatics. Prerequisite: Music 265 and 381; consent of instructor. 3 hours or 1/2 unit. May be repeated to a maximum of 6 hours or 1 unit.
324. **Opera Production, II.** Helps interested students on the graduate level study the problems of the lyric stage; investigation of and practice with casting methods, program selections, production procedures, stage direction, coaching methods, and opera dramatics. Prerequisite: Music 323. 3 hours or 1/2 unit. May be repeated to a maximum of 6 hours or 1 unit.
325. **Introduction to Musicology, I.** Survey of the discipline of musicology, its scope, and its history with bibliographical studies and sample problems for investigation. Prerequisite: Graduate standing in musicology or consent of instructor. 4 hours or 1 unit (summer session, 2 hours or 1/2 unit).
326. **Introduction to Musicology, II.** Continuation of a survey of the discipline of musicology; special attention to class projects in systematic musicology and to the philosophy of music history. Prerequisite: Music 325 or consent of instructor. 4 hours or 1 unit (summer session, 2 hours or 1/2 unit).
327. **Urban Popular Music.** Introduction to the world's popular music; emphasis on its role in society, based on American, European, Latin American, and non-Western repertoires. Prerequisite: Music 130 or equivalent, or consent of instructor. 2 hours or 1/2 unit.
328. **Composer-Choreographer Workshop.** Same as Dance 328. See Dance 328.
330. **Applied Music Pedagogy.** Survey of techniques, practices, and materials; presentation of group and individual instruction; an approach to teaching problems, tone production, musical styles, and interpretation for various age levels; and actual teaching experience under faculty supervision. Required of applied music majors in voice and string instruments. Prerequisite: Junior standing in music or consent of instructor. 2 hours or 1/2 unit. May be repeated to a maximum of 4 hours or 1 unit.
331. **Piano Pedagogy, I.** Objectives, techniques, literature, and materials for teaching the child from about ages five through ten (elementary level); observation of lessons and supervised student teaching experience. Prerequisite: Senior standing in music or music education, or consent of instructor. 2 hours or 1/2 unit.
332. **Piano Pedagogy, II.** Objectives, techniques, literature, and materials for teaching the young pianist from about ages eleven through eighteen (middle school to

- pre-college level); teaching the adult beginner; and observation of lessons and supervised student teaching experience. Prerequisite: Senior standing in music or music education, or consent of instructor. 2 hours or 1/2 unit.
334. **The Music of America, I.** Study of folk, popular, and art music in America from the time of the first European settlers through the middle of the nineteenth century; psalmody, early opera and concert life, African and European folk music, the singing school, music of European immigrants, and the roots of jazz. Prerequisite: Senior standing in music or consent of instructor. 3 hours or 3/4 unit.
335. **The Music of America, II.** Study of chamber, choral, and orchestral music written by American composers from 1850 to the present; jazz and its offshoots; folk and popular music; and experimental music in America. Prerequisite: Senior standing in music or consent of instructor. 3 hours or 3/4 unit.
336. **Music in Latin America.** The history of music in Latin America from colonial times to the present, including its cultural and social background. Prerequisite: Junior standing or consent of instructor. 3 hours or 3/4 unit.
337. **National and Regional Studies in European Music History.** Studies in the history of music of individual nations and regions of Europe. Each semester is devoted to one area, such as Great Britain, Spain and Portugal, Russia, Scandinavia, or eastern Europe. Prerequisite: Junior standing in music or consent of instructor. 3 hours or 3/4 unit. May be repeated to a maximum of 6 hours or 1 1/2 units.
339. **Functional Music for Exceptional Children and Youth.** Features techniques and methods to aid exceptional children and youth in acquiring and improving self-concept, socialization skills, attention span, listening skills, language acquisition, and academic readiness; considers the use of music techniques and methods in acquiring these skills in the mainstreamed classroom. Prerequisite: Consent of instructor. 3 hours or 1/2 unit.
340. **Marching Band Procedures.** A detailed consideration of principles and procedures for preparing a marching band to participate in parades, ceremonials, and shows for sports events. Prerequisite: Junior standing in instrumental music education. 2 hours or 1/2 unit.
341. **Seminar in Instrumental Music Education.** Intensive study of musical, scientific, and educational concepts and principles related to the teaching of heterogeneous combinations of instruments. Prerequisite: Completion of student teaching or graduate standing in music education. 2 hours or 1/2 unit.
342. **Band Arranging.** The development of basic scoring and arranging skills for various instrumental ensembles. Marching and smaller instrumental combinations are the performance media used for scoring purposes. Prerequisite: Music 104 or equivalent. 2 hours or 1/2 unit.
343. **Tests and Measurement in Music Education.** Construction, design, appraisal, and use of measurement devices for music teaching and research. Prerequisite: Consent of instructor. 2 or 4 hours, or 1/2 or 1 unit.
345. **Teaching Techniques of Music Theory.** Teaching materials, methods, texts, and pedagogical sequence are discussed and analyzed, including an intensive survey of the structural materials normally covered during the first two years of collegiate study. Prerequisite: Music 300 or consent of instructor. 2 hours or 1/2 unit.
346. **Workshop in Music Education.** Development of essential facts, attitudes, and principles through a consideration of problems encountered in music education. Parallel with this study is the preparation of resource materials for music programs in elementary and secondary schools. 2 or 4 hours, or 1/2 or 1 unit. May be repeated to a maximum of 2 units. Offered in the summer session only.
347. **Teaching of Woodwind Instruments.** Designed primarily for teachers of instrumental music in the public schools. Prerequisite: Senior or graduate standing in music education or consent of instructor. 2 hours or 1/2 unit. Offered in the summer session of 1974 and in alternate years.
348. **Teaching of Brass Instruments.** Designed primarily for teachers of instrumental music in the public schools. Prerequisite: Senior or graduate standing in music

- education or consent of instructor. 2 hours or 1/2 unit. Offered in the summer session of 1974 and in alternate years.
349. **Music in Early Childhood.** Same as Human Development and Family Ecology 349. Detailed consideration of the music program in nursery schools, kindergarten, and the primary grades; topics include the nature of early musical responses, objectives, experience levels of the program, methods of teaching, and materials. Observation of music teaching at the Child Development Laboratory is included in the course work. Prerequisite: Senior or graduate standing in music or human resources and family studies, or consent of instructor. 2 hours or 1/2 unit.
350. **Advanced Ensemble Music.** Selected projects in the study and performance of ensemble literature, including the areas of operatic, instrumental, and vocal-choral music and accompanying. Prerequisite: Consent of instructor. 1 to 2 hours, or 1/4 to 1/2 unit.
355. **School/Community Musical Theatre Production.** Problems and techniques involved with technical and artistic production of musicals in the junior and senior high schools and in the community. Prerequisite: Advanced undergraduate or graduate standing in music education or performance curricula, or consent of instructor. 2 hours or 1/2 unit.
360. **Advanced Group Instruction in Piano, I.** A comprehensive keyboard musicianship course for advanced pianists emphasizing the development of the following skills: sight reading, harmonization, transposition, improvisation, playing by ear, and vocal and instrumental score reading. Ensemble piano music is performed. Prerequisite: Music 180 (12 hours completed) or Music 163, and Music 104 and 109, or equivalent; consent of instructor. 2 hours or 1/2 unit.
361. **Advanced Group Instruction in Piano, II.** Continuation of Music 360. Comprehensive keyboard musicianship course for advanced pianists emphasizing the development of the following skills: sight reading, harmonization, transposition, improvisation, playing by ear, and vocal and instrumental score reading. Ensemble piano music is performed. Prerequisite: Music 180 (12 hours completed) or Music 163; Music 104 and 109 or equivalent; Music 360 or equivalent and consent of instructor. 2 hours or 1/2 unit.
362. **Advanced Jazz Piano Improvisation.** Study of solo jazz piano improvisation on an advanced level. Includes practical experience in traditional, modern, and abstract solo performance, as well as theoretical, stylistic, and historical background. Prerequisite: Music 151 or equivalent. 2 hours or 1/2 unit. May be repeated to a maximum of 4 hours or 1 unit.
366. **Vocal Repertoire, I.** To be taken with Music 381. Study of the standard solo literature, including solo excerpts from larger works, i.e., cantata, oratorio, and opera; supplements the student's knowledge of the literature in his special field. Prerequisite: Junior standing in voice or consent of instructor. 1 hour.
367. **Vocal Repertoire, II.** To be taken with Music 381. Study of the standard solo literature, including solo excerpts from larger works, i.e., cantata, oratorio, and opera; supplements the student's knowledge of the literature in his special field. Prerequisite: Junior standing in voice; consent of instructor. 1 hour.
377. **Principles of Accompanying.** Grasp of the fundamental principles of accompanying singers and instrumentalists; practical experience in accompanying; and facility in sight reading for keyboard performers. Prerequisite: Advanced undergraduate or graduate standing in music or music education and consent of instructor. 4 hours or 1 unit (summer session, 2 hours or 1/2 unit). May be repeated to a maximum of 16 hours or 4 units

Note: Music 378 through 398 (applied music) have the following prerequisite: For students in the Bachelor of Music curriculum, junior standing in the major applied music subject; for students in music education, completion of the curricular requirement in the major applied music subject; and for students in other colleges of the University, completion of four semesters in comparable applied music course at the 100-level.

378. **Guitar.** Instruction in guitar at the advanced undergraduate and graduate levels; predominantly classical. 2 or 4 hours, or 1/2 or 1 unit (summer session, 1 or 2 hours, or 1/4 or 1/2 unit).
379. **Harpsichord.** Instruction in harpsichord at the advanced undergraduate and graduate level. 2 or 4 hours, or 1/2 or 1 unit (summer session, 1 or 2 hours, or 1/4 or 1/2 unit).
380. **Piano.** Instruction in piano at the advanced undergraduate and graduate level. 2 or 4 hours, or 1/2 or 1 unit (summer session, 1 or 2 hours, or 1/4 or 1/2 unit).
381. **Voice.** Instruction in singing at the advanced undergraduate and graduate level. 2 or 3 hours, or 1/2 or 1 unit (summer session, 1 or 2 hours, or 1/4 or 1/2 unit).
382. **Organ.** Instruction in organ at the advanced undergraduate and graduate level. 2 or 4 hours, or 1/2 or 1 unit (summer session, 1 or 2 hours, or 1/4 or 1/2 unit).
383. **Violin.** Instruction in violin at the advanced undergraduate and graduate level. 2 or 3 hours, or 1/2 or 1 unit (summer session, 1 or 2 hours, or 1/4 or 1/2 unit).
384. **Viola.** Instruction in viola at the advanced undergraduate and graduate level. 2 or 3 hours, or 1/2 or 1 unit (summer session, 1 or 2 hours, or 1/4 or 1/2 unit).
385. **Cello.** Instruction in violoncello at the advanced undergraduate and graduate level. 2 or 3 hours, or 1/2 or 1 unit (summer session, 1 or 2 hours, or 1/4 or 1/2 unit).
386. **String Bass.** Instruction in string bass at the advanced undergraduate and graduate level. 2 or 3 hours, or 1/2 or 1 unit (summer session, 1 or 2 hours, or 1/4 or 1/2 unit).
387. **Flute.** Instruction in flute at the advanced undergraduate and graduate level. 2 or 4 hours, or 1/2 or 1 unit (summer session, 1 or 2 hours, or 1/4 or 1/2 unit).
388. **Clarinet.** Instruction in clarinet at the advanced undergraduate and graduate level. 2 or 4 hours, or 1/2 or 1 unit (summer session, 1 or 2 hours, or 1/4 or 1/2 unit).
389. **Oboe.** Instruction in oboe at the advanced undergraduate and graduate level. 2 or 4 hours, or 1/2 or 1 unit (summer session, 1 or 2 hours, or 1/4 or 1/2 unit).
390. **Bassoon.** Instruction in bassoon at the advanced undergraduate and graduate level. 2 or 4 hours, or 1/2 or 1 unit (summer session, 1 or 2 hours, or 1/4 or 1/2 unit).
391. **Cornet and Trumpet.** Instruction in cornet and trumpet at the advanced undergraduate and graduate level. 2 or 4 hours, or 1/2 or 1 unit (summer session, 1 or 2 hours, or 1/4 or 1/2 unit).
392. **French Horn.** Instruction in French horn at the advanced undergraduate and graduate level. 2 or 4 hours, or 1/2 or 1 unit (summer session, 1 or 2 hours, or 1/4 or 1/2 unit).
393. **Trombone.** Instruction in trombone at the advanced undergraduate and graduate level. 2 or 4 hours, or 1/2 or 1 unit (summer session, 1 or 2 hours, or 1/4 or 1/2 unit).
394. **Euphonium.** Instruction in euphonium at the advanced undergraduate and graduate level. 2 or 4 hours, or 1/2 or 1 unit (summer session, 1 or 2 hours, or 1/4 or 1/2 unit).
395. **Tuba.** Instruction in tuba at the advanced undergraduate and graduate level. 4 hours, or 1/2 or 1 unit (summer session, 1 or 2 hours, or 1/4 or 1/2 unit).
396. **Percussion.** Instruction in percussion at the advanced undergraduate and graduate level. 2 or 4 hours, or 1/2 or 1 unit (summer session, 1 or 2 hours, or 1/4 or 1/2 unit).
397. **Harp.** Instruction in harp at the advanced undergraduate and graduate level. 2 or 4 hours, or 1/2 or 1 unit (summer session, 1 or 2 hours, or 1/4 or 1/2 unit).
398. **Saxophone.** Instruction in saxophone at the advanced undergraduate level. 2 or 4 hours, or 1/2 or 1 unit (summer session, 1 or 2 hours, or 1/4 or 1/2 unit).
400. **Advanced Instrumentation: Chamber and Symphonic.** Orchestration for chamber and symphony orchestras; works of classical, romantic, and modern composers. Prerequisite: Undergraduate instrumentation. 1/2 or 1 unit.

401. **Advanced Instrumentation: Band.** Arrangement for the concert band of works from orchestra, organ, and chamber music by composers of the classical, romantic, and modern periods. Prerequisite: Undergraduate instrumentation. 1/2 or 1 unit.
402. **Analysis in Relation to Performance and Interpretation, I.** A unifying course in the structure of music, in which analysis is related to the performance and understanding of music; course material drawn from standard literature from the Renaissance to the present day with emphasis on the smaller forms. Prerequisite: Music 104 or equivalent; consent of instructor. 1/2 or 1 unit.
405. **Individual Topics in Music Theory.** Studies in specialized areas of analysis, theory systems, and aesthetics for theory- composition majors. Prerequisite: Graduate standing in music; consent of instructor. 1/2 or 1 unit. May be repeated to a maximum of 3 units.
406. **Composition.** Advanced study of contrapuntal forms; study of contemporary melodic and harmonic practices; and original work in advanced composition. 1/2 to 1 1/2 units.
410. **History of Music Theory.** Prerequisite: Graduate standing in musicology or composition, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
411. **Introduction to Ethnomusicology.** Comprehensive survey of concepts, problems, and methods of research in non-Western and folk music. Prerequisite: Graduate standing in musicology or consent of instructor. 1 unit.
412. **History of Musical Aesthetics, I.** Survey of the principal philosophies of music from Pythagoreanism to the humanistic period, their historical backgrounds, and their relation to musical styles. Prerequisite: Graduate standing in music. 1/2 or 1 unit.
413. **History of Musical Aesthetics, II.** Survey of the principal philosophies of music, their historical backgrounds, and their relation to musical styles from the seventeenth century to the present day. Prerequisite: Music 412. 1/2 or 1 unit.
414. **Notation, I.** History of notation from its beginning to 1400. Prerequisite: Consent of instructor. 1/2 unit.
415. **Notation, II.** History of notation from 1400 to 1600, including instrumental tablatures. Prerequisite: Music 414 or consent of instructor. 1/2 unit.
417. **History of Instrumental Music from 1600 to 1750.** Prerequisite: Consent of instructor. 1/2 or 1 unit.
418. **Topics in Opera History.** Intensive study of a period or school of opera composition or of a particular aspect of the history of opera. Wide reading in the social and intellectual climate of the period concerned; literary, dramatic, and musical analysis; and work with primary sources whenever possible. Prerequisite: Music 428, graduate standing in musicology, or consent of instructor. 1 unit (summer session, 1/2 unit).
421. **Research in Music Education.** Introduction to problems and methods of research in music education. Required of all candidates for the Doctor of Education in music education. Prerequisite: Graduate standing in music or music education. 1/2 or 1 unit.
422. **Seminar in Theory of Music.** Intensive study of selected topics in the fields of music theory, history of theory, and history of musical materials. Prerequisite: Graduate standing in music theory or consent of instructor. 1/2 or 1 unit.
423. **Seminar in Musicology.** Problems in historical and systematic musicology or ethnomusicology; discussions of special problems and reports on individual research. Prerequisite: Graduate standing in musicology or consent of instructor. 1 unit.
424. **Seminar in the Works of a Selected Composer.** A seminar devoted to intensive historical and analytical study of the works of important composers; each semester devoted to one composer, e.g., Bach, Beethoven, Handel, Haydn, Mozart, or Wagner. Prerequisite: Music 213 and 214; two of the following: Music 310, 311, 312, 313, or 315, or equivalent. 1 unit (summer session, 1/2 unit). May be repeated for a maximum of 2 units.

425. **Readings in Musicology and Music Theory.** Individual guidance in intensive readings in the literature of musicology or music theory, selected in consultation with the instructor and in accordance with the needs and interests of the student. Prerequisite: Graduate standing in musicology or music theory. 1/2 or 1 unit (summer session, 1/2 unit).
426. **Choral Literature, I.** Survey of choral and vocal ensemble repertoire from the Middle Ages to 1750. Prerequisite: Open to graduate music students by consent of instructor. 1/2 unit.
427. **Choral Literature, II.** Survey of choral repertoire from 1750 to the present. Prerequisite: Open to graduate music students by consent of instructor. 1/2 unit.
428. **Problems and Methods.** Introduction to methods in research and stylistic criticism and to bibliographic aids, editions, and editing of music, as related to the work of the musician and composer. Reports of bibliographic problems and on individual projects are presented orally and in writing. Required of all students in the Master of Music program, except those majoring in musicology. 1 unit.
429. **Historical Studies in Twentieth-Century Music.** A seminar in contemporary music, with emphasis on the historical foundations of current trends in musical composition. Prerequisite: Music 315 or 422, or equivalent. 1/2 or 1 unit (summer session, 1/2 unit). May be repeated to a maximum of 2 units.
430. **Advanced Orchestra Conducting and Literature.** Intensive study of conducting techniques and problems related to standard orchestral literature; survey of materials for school and community orchestras. Prerequisite: Music 233 or equivalent, and consent of instructor. 1/2 or 1 unit.
431. **Advanced Band Conducting and Literature.** Study of problems and techniques of band conducting; survey of literature for the concert band. Prerequisite: Graduate standing in music or music education. 1/2 or 1 unit.
432. **Advanced Choral Techniques, I.** An intensive laboratory approach to the development of advanced techniques necessary for working effectively with choral ensembles. Prerequisite: Graduate standing in music. 1/2 or 1 unit.
433. **Advanced Choral Techniques, II.** An intensive survey of choral literature with laboratory organization for reading, conducting, and interpreting choral music of all periods, styles, and voice arrangements. Prerequisite: Graduate standing in music, Music 432 or equivalent, or consent of instructor. 1/2 or 1 unit.
434. **Piano Literature.** Prerequisite: Bachelor of Music or Bachelor of Science in Music Education, or consent of instructor. 1 unit. May be repeated for a maximum of 2 units.
435. **Vocal Literature.** Study of solo song in larger works, and solo art song. Prerequisite: Bachelor of Music or Bachelor of Science in Music Education, or consent of instructor. 1 unit. May be repeated for a maximum of 2 units.
436. **Organ Literature.** An intensive study of organ literature from Bach to the present; includes the music itself, recordings, and collateral readings. Prerequisite: Bachelor of Music or Bachelor of Science in Music Education, or consent of instructor. 1 unit. May be repeated for a maximum of 2 units.
437. **String Instrument Literature.** Prerequisite: Bachelor of Music or Bachelor of Science in Music Education, or consent of instructor. 1 unit. May be repeated for a maximum of 2 units.
438. **Wind Instrument Literature.** Survey at the graduate level of the field of solo and ensemble wind literature; includes analysis and performance, when possible, of the music itself, recordings, and collateral readings. 1 unit. May be repeated for a maximum of 2 units.
439. **Percussion Instruments Literature.** Survey and analysis of the field of solo and ensemble percussion literature; includes analysis and performance, when possible, of the music itself, recordings, and collateral readings. Prerequisite: Graduate standing in music; consent of instructor. 1 unit. May be repeated for a maximum of 2 units.
440. **Foundations and Principles of Music Education, I.** A consideration of the historical and philosophical foundations of music education and their application to

- the process of program development in music education. Prerequisite: Graduate standing in music education or music. 1/2 or 1 unit.
441. **Foundations and Principles of Music Education, II.** A consideration of the psychological foundations of music education and their application to the processes of instruction, administration, supervision, and evaluation of music education programs. Prerequisite: Graduate standing in music education or music. 1/2 or 1 unit.
442. **The General Music Program in Secondary Schools.** Detailed consideration of the general music program, its objectives, organization, and operation; special attention to materials and methods of teaching. 1/2 or 1 unit.
443. **Administration and Supervision of Music Education.** Deals with the functions of supervisors and directors of music education in administering music programs in elementary and secondary schools. 1/2 or 1 unit.
444. **The General Music Program in Elementary Schools.** Detailed consideration of elementary general music, its objectives, organization, and operation; special attention to materials and methods of teaching. 1/2 or 1 unit.
445. **Music in Higher Education.** An orientation to the organization, teaching, and administration of music in the college and university. Prerequisite: Graduate standing in music education or music. 1/2 or 1 unit. Offered in summer session only.
446. **Seminar in Experimental Music, I.** Survey of contemporary electronic music, computer music, and related types of music; discussion of relevant music theory. Prerequisite: Consent of instructor. 1/2 unit.
447. **Seminar in Experimental Music, II.** Continuation of Music 446. Prerequisite: Music 446 or consent of instructor. 1/2 unit.
448. **Computer Music.** Representation of sound signals in a digital computer; methods for input and output of sounds to and from a computer; sound synthesis programs; synthesis of simple musical structures; use of graphics; processing of live sounds by computer; editing and retrieval; fidelity of computer-produced sounds; and hybrid analog/digital computers. Prerequisite: Graduate standing in composition-theory or consent of instructor. 1 unit.
449. **Problems in Band Conducting.** An examination of techniques of rehearsal, conducting, and preparation of band organizations for concert performance; emphasizes discussion, analysis, and preparation of selected scores and the problems they present. Prerequisite: Graduate standing or experience as a band conductor. 1/2 or 1 unit.
450. **History of Vocal Ensemble and Choral Music, I.** Critical and analytic study of vocal and choral ensemble music from the Middle Ages to 1750. Prerequisite: Music 426 and 427, or consent of instructor. 1 unit (summer session, 1/2 unit).
451. **History of Vocal Ensemble and Choral Music, II.** Critical and analytic study of vocal and choral ensemble music from 1750 to the present. Prerequisite: Music 450 or consent of instructor. 1 unit (summer session, 1/2 unit).
452. **Choral Conducting Project.** Required of candidates for the degree of Master of Music with choral music option during the final semester in residence; includes participation in a graduate choral conducting laboratory and preparation of a choral ensemble for public performance. Prerequisite: Music 432 and consent of instructor. 1/2 unit.
454. **Advanced Choral Performance Techniques.** Study of performance problems and musical analysis of choral music with techniques of preparation and rehearsal from the various style periods: Renaissance, baroque, classic-romantic, and contemporary. Prerequisite: Admission into the Doctor of Musical Arts choral music program, or the equivalent background in other doctoral degree programs. 1/2 unit. May be repeated to a maximum of 2 units.
455. **The Choral Program in Secondary Schools.** An in-depth study of the methods and materials appropriate for teaching choral music in the secondary schools. Prerequisite: Graduate standing in music or music education. 1/2 or 1 unit.
456. **Advanced Computer Music.** Compositional approaches to computer music; advanced digital computer sound synthesis using the computer programs MUSIC 360 and MUSIC 4BF; compositional algorithms; user-written sound generation

routines; new concepts of timbre in digital sound synthesis; digital/analog and analog/digital conversion; and installation of computer music programs. Prerequisite: Music 448 or consent of instructor. 1 unit.

- 460. Practicum in Group Piano Teaching: Children and Teenagers.** Student teaching of group piano and musicianship classes for elementary, middle, and high school students; weekly seminar devoted to evaluation and improvement of teaching techniques. Prerequisite: Graduate standing in music; Music 331 or equivalent. 1 unit.
- 461. Practicum in Group Piano Teaching: Adults.** Student teaching of group piano for adults in the private studio, community college, and university; weekly seminar devoted to evaluation and improvement of teaching techniques. Prerequisite: Graduate standing in music; Music 332 or equivalent. 1 unit.
- 462. Literature of Guitar and Related Instruments.** Survey of solo and ensemble literature for guitar. The first semester considers music for the guitar, vihuela, lute, and related instruments up to 1750; the second semester covers music for the guitar and related instruments from 1750 to the present. Prerequisite: Graduate standing in music. 1 unit. May be repeated to a maximum of 2 units as topic varies.
- 477. Advanced Accompanying.** Grasp of the fundamental principles of accompanying singers and instrumentalists, practical experience in accompanying, and facility in sight reading for keyboard performers. Prerequisite: Graduate standing in music or music education and/or consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
- 480. Piano.** Prerequisite: Bachelor of Music degree; successful completion of a qualifying examination given by the graduate committee. 1/2 or 1 unit.
- 481. Voice.** Prerequisite: Bachelor of Music degree; successful completion of a qualifying examination given by the graduate committee. 1/2 or 1 unit.
- 482. Organ.** Selected studies from the masterworks of organ literature. Prerequisite: Bachelor of Music degree; successful completion of a qualifying examination given by the graduate committee. 1/2 or 1 unit.
- 483. String Instruments.** Prerequisite: Bachelor of Music degree; successful completion of a qualifying examination given by the graduate committee. 1/2 or 1 unit.
- 484. Wind Instruments.** Prerequisite: Bachelor of Music degree; successful completion of a qualifying examination given by the graduate committee. 1/2 or 1 unit.
- 485. Percussion Instruments.** Prerequisite: Bachelor of Music degree; successful completion of a qualifying examination given by the graduate committee. 1/2 or 1 unit.
- 489. Doctoral Projects.** Special projects for candidates for the Doctor of Musical Arts; open only to students in the Doctor of Musical Arts program. Prerequisite: Consent of instructor. 0 to 4 units (summer session, 0 to 2 units).
- 499. Thesis Research.** Research in special projects. Prerequisite: Consent of instructor. 0 to 4 units

NAVAL SCIENCE

Head of Department: Captain W. J. Rodriguez, USN

Department Office: 236 Armory Building, 505 E. Armory, Champaign

- 100. Naval Science Laboratory.** A noncredit course designed to give the Naval ROTC student, through practical application, a better grasp of the naval science subjects taught in the classroom and a working knowledge of close order drill. 0 credit.
- 111. Introduction to Naval Science.** Naval organization and management practices examined within the context of the naval service; command and control, organization for logistics, service and support, functions and services of major components of the Navy and Marine Corps, and shipboard organization; and emphasis on management

- and leadership functions. Prerequisite: Approval of professor of naval science; concurrent registration in Naval Science 100. 2 hours.
112. **Naval Ships Systems, I.** Study of ship compartmentation, propulsion systems, auxiliary power systems, interior communications, and ship control; types, structure, and purpose of naval ships; and examination of elements of ship design and ship stability. Prerequisite: Naval Science 111 or consent of instructor. 3 hours.
 121. **Naval Ships Systems, II.** Introduction to concepts of naval weapons systems, their capabilities and limitations, and their individual and complementary roles in a wide variety of offensive and defensive situations. Prerequisite: Credit or concurrent registration in Physics 102 or equivalent, and one course in computer science, or consent of instructor. 3 hours.
 124. **Sea Power and Maritime Affairs.** An investigation of the characteristics of sea power and their impact on the affairs of our nation; discusses those characteristics with historical and modern applications to the United States and other world powers. 2 hours.
 231. **Navigation and Naval Operations, I.** Provides the student with an understanding of the theory and techniques of the three types of marine (nautical) navigation: piloting, electronic, and celestial. Prerequisite: Junior standing in NROTC Program; registration in Naval Science 100 or consent of instructor. 3 hours.
 232. **Navigation and Naval Operations, II.** Designed to give an understanding of the concepts and use of relative motion principles, international maritime law and the rules of the nautical road, and the fundamentals of U.S. fleet organization, communication, and operations. Prerequisite: Junior standing in NROTC Program; concurrent registration in Naval Science 100, or consent of instructor. 3 hours.
 241. **Naval Leadership and Management, I.** Introduction to management and organizational behavior with emphasis on motivation, leadership, communication, interpersonal relations, and decision making processes; theory is applied to current problems in the naval organization. Prerequisite: Senior standing in NROTC Program or consent of instructor. 2 hours.
 242. **Naval Leadership and Management, II.** Continuation of Naval Science 241. Examines Navy organization, personnel administration procedures, human resource management programs, and military justice in terms of current management theory. Prerequisite: Naval Science 241 or consent of instructor. 2 hours. 291. Evolution of Warfare. Survey of the evolution of warfare emphasizing the philosophies and trends which have been significant in land warfare. Prerequisite: Concurrent enrollment in Naval Science 100 or consent of instructor. 3 hours.
 293. **History of Amphibious Warfare.** Study of amphibious operations and the evolution of amphibious warfare doctrine and development. Prerequisite: Advanced undergraduate standing or consent of instructor. 3 hours

NUCLEAR ENGINEERING

Chairperson of Program: Professor G. H. Miley

Program Office: 214 Nuclear Engineering Laboratory, 103 South Goodwin, Urbana

197. **Nuclear Energy and Its Uses.** Discussions and lectures to orient freshmen and sophomores to the role of nuclear engineering in society and technology. 1 hour.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
241. **Introduction to Radiation Protection.** Same as Environmental Studies 241. An introductory course in the elements of radiation protection and health physics, emphasizing practical applications. Prerequisite: Math 120 or equivalent. 2 hours.
243. **Radiation Protection Laboratory.** A laboratory course designed to provide an understanding of radiation and to introduce various radiation detection instruments and devices used in radiation protection. Prerequisite: Credit or registration in Nuclear Engineering 241 or consent of instructor. 1 hour.

- 290. Special Topics.** Considers selected areas which are of current interest to undergraduates in nuclear engineering but which are not adequately covered in other formal courses. Prerequisite: Consent of instructor. 1 to 4 hours.
- 295. Special Problems.** Individual investigations or studies of any phase of nuclear engineering selected by the student and approved by the department. Prerequisite: Senior standing or consent of instructor. 1 to 4 hours. May be repeated.
- 302. Nuclear Power Engineering.** Same as Mechanical Engineering 302. Principles of release and utilization of fission energy in nuclear power engineering; includes such topics as fission processes and controlled chain reactions; nuclear reactor types, design principles, and operational characteristics; power reactor design criteria; radiation hazards and radioactive waste treatment; economics; and other applications such as propulsion and research reactors. Students who plan to take more extensive training in nuclear technology are advised to take the Physics/Nuclear Engineering 346 - Nuclear Engineering 347 sequence. Prerequisite: Consent of instructor. 3 hours or 1 unit. Credit for both Nuclear Engineering 302 and Nuclear Engineering 347 cannot be given toward the same degree.
- 312. Nuclear Power Economics and Fuel Management.** A quantitative analysis of the economic impact of the nuclear power industry; nuclear fuel cycle and capital costs for thermal and fast reactors; optimization of the use of nuclear fuels to provide the lowest energy costs and highest system performance; and comparison between fossil fuel systems, fission systems, and controlled thermonuclear systems. Prerequisite: Junior standing; Mechanical Engineering 302, or Nuclear Engineering 302 or 347, or consent of instructor. 3 hours or 1 unit.
- 321. Introduction to Controlled Thermonuclear Fusion.** Same as Electrical Engineering 321. Review of Maxwell's equations and introduction to plasma physics as it applies to controlled thermonuclear fusion problems; energy balance; plasma confinement and stability; and recent approaches to the fusion reactor. Prerequisite: Senior or graduate standing, or consent of instructor. 4 hours or 1 unit.
- 341. Principles of Radiation Protection.** Sources of nuclear radiation; ionization and energy deposition in physical and biological media; principles of dosimetry; determination of protection limits for external and internal emitters; and basic shielding analysis. Prerequisite: Nuclear Engineering 346 or Nuclear Engineering 397, or consent of instructor. 4 hours or 1 unit.
- 342. Radioactive Waste Management.** Sources and characteristics of radioactive wastes; methods of treatment; monitoring techniques; methods of hazard evaluation; special aspects of solid, liquid, and gaseous wastes; and disposal, both temporary and permanent. Prerequisite: Nuclear Engineering 346 or 397, or equivalent. 2 hours or 1/2 unit.
- 346. Modern Physics for Nuclear Engineers.** Same as Physics 346. See Physics 346.
- 347. Introduction to Nuclear Engineering.** Energy resources and nuclear power systems; basic principles of fission reactor operation; reactor control and heat removal; radiation protection and shielding of reactors; and safeguards, licensing, and environmental considerations. Prerequisite: Credit or registration in Nuclear Engineering 346, or equivalent. 3 hours or 3/4 unit. Credit for both Nuclear Engineering 347 and Nuclear Engineering 302 cannot be given toward the same degree.
- 351. Nuclear Engineering Laboratory.** Radiation detection and instrumentation; radiation dosimetry and shielding; subcritical assemblies; reactor operations; basic measurements in nuclear engineering; and engineering applications. Prerequisite: Nuclear Engineering 346 or equivalent, and credit or registration in Nuclear Engineering 347. 3 hours or 3/4 unit.
- 355. Reactor Statics and Dynamics.** Intermediate-level analysis of thermal and fast reactor assemblies; reactor statics, reactor dynamics, and introductory transport theory; homogeneous and heterogeneous reactors; and multigroup diffusion theory, perturbation theory, reactivity coefficients, and control rod analysis. Prerequisite: Nuclear Engineering 347 or equivalent, or consent of instructor. 4 hours or 1 unit.

357. **Safety Analysis of Nuclear Reactor Systems.** Basic safety philosophy in nuclear reactor systems; brief review of nuclear reactor systems; regulatory processes; siting considerations; safety problems related to reactor dynamics; evaluation of postulated accidents; risks associated with nuclear fuel cycle; and methods of systems safety analysis. Prerequisite: Nuclear Engineering 302 or 347, or equivalent, or consent of instructor. 3 hours, or 3/4 or 1 unit.
358. **Design in Nuclear Engineering.** Introduction to design in nuclear engineering systems; basic principles of definition, organization, constraints, modeling, and optimization of system design; case studies; and class design projects applying these basic principles. Prerequisite: Nuclear Engineering 347. 3 hours or 3/4 unit.
388. **Nuclear Ceramics.** Same as Ceramic Engineering 388. See Ceramic Engineering 388.
390. **Intermediate Special Topics.** Considers selected areas of current interest in nuclear engineering which are not adequately covered in other formal courses. Prerequisite: Consent of instructor. 1 to 4 hours, or 1/4 to 1 unit.
397. **Radiochemistry.** Same as Chemistry 397. See Chemistry 397.
398. **Radiochemistry Laboratory.** Same as Chemistry 398. See Chemistry 398.
401. **Fundamentals of Nuclear Engineering.** A lecture and problem course to provide background for further work in nuclear engineering; problems in materials, heat transfer, and fluid flow; and special emphasis on basic ideas and the mathematical similarity of problems in heat transfer, fluid flow, and neutron diffusion. Prerequisite: Mathematics 345 or equivalent; credit or concurrent registration in Nuclear Engineering 397 or Physics 382, or equivalent. 1 unit.
411. **Nuclear Reactor Heat Transfer.** Selected topics in nuclear reactor heat transfer: thermal analysis of fuel elements under steady and transient operation; convective energy transport from reactor cores; two-phase flow and boiling in reactor cores; and liquid metal coolant systems. Prerequisite: Nuclear Engineering 401 or consent of instructor. 1 unit.
421. **Interaction of Radiation with Matter.** Topics in the interaction of radiation with matter of interest to the nuclear engineering field: the kinematics, kinetics, and cross sections involved in the interaction of charged particles, electromagnetic radiation, and neutrons. Prerequisite: Nuclear Engineering 346 or 397, or equivalent. 1 unit.
422. **Controlled Fusion Systems, I.** Same as Electrical Engineering 422. Development of plasma models for fusion analysis; treatment of plasma heating and confinement with applications to current experiments; and energy balances and energy extraction. Prerequisite: Nuclear Engineering 321 or consent of instructor. 1 unit.
423. **Controlled Fusion Systems, II.** Development of plasma models for high-beta pulsed fusion systems and for pellet fusion systems; heating and confinement mechanisms; energy balances and energy extraction; and applications to current experiments. Prerequisite: Nuclear Engineering 422 or consent of instructor. 1 unit.
424. **Stability Problems in Fusion Systems.** Survey of instabilities of interest in controlled thermonuclear fusion; overall system instabilities in fusion power reactors and applications; macro-instabilities and micro-instabilities of interest in CTR devices, and practical implications for proposed fusion reactor designs; and instabilities resulting from refueling and heating. Prerequisite: Nuclear Engineering 422 or consent of instructor. 1 unit.
425. **Nuclear-Electrical Energy Conversion.** Same as Electrical Engineering 425. Advanced concepts in nuclear radiation energy conversion of importance in both power production and radiation detection; analysis and applications of direct collection of charged particles; and theory and applications of radiation-induced ionization and excitation. 1 unit.
431. **Nuclear Metallurgy.** Metallurgical principles applied to materials problems in nuclear engineering; includes topics in production of uranium, corrosion, radiation damage, fuel element fabrication, and fuel reprocessing. Prerequisite: Consent of instructor. 1 unit.
441. **Nuclear Radiation Shielding.** Basic concepts, radiation sources, elementary gamma ray and neutron shielding, geometry factors in shielding, advanced techniques

(such as Monte Carlo and discrete ordinates), special topics (such as shield heating, duct streaming, and albedo theory), and practical aspects. Prerequisite: Nuclear Engineering 341 or consent of instructor. 1 unit.

- 451. **Reactor Laboratory.** Reactor operation: start-up, changes in power level, and shut-down; reactor instrumentation: subcritical assemblies; flux measurements in core and thermal column; control rod worth measurements; effects of changes in fuel configurations; and activation and neutron-beam experiments. Prerequisite: Nuclear Engineering 347 and 351, or equivalent. 1/2 or 1 unit.
- 454. **Nuclear Engineering Laboratory Investigations.** Individual investigation in nuclear engineering. Prerequisite: Consent of instructor. 1/4 to 2 units.
- 455. **Reactor Theory, I.** Same as Physics 455. Advanced development of neutron transport theory; neutron slowing-down and resonance absorption; approximations to the transport equation; direct numerical methods and other techniques of approximation theory applied to the neutron transport equation; and advanced topics. Prerequisite: Nuclear Engineering 355, graduate standing in physics, or consent of instructor. 1 unit.
- 456. **Reactor Theory, II.** Same as Physics 456. Advanced treatment of the theory of slow-neutron scattering, neutron thermalization, Doppler broadening, fuel depletion and fuel loadings, properties of neutron migration operators, and mathematical neutron transport theory; interpretation of related experiments; and advanced topics. Prerequisite: Nuclear Engineering 421 or 455, graduate standing in physics, or consent of instructor. 1 unit.
- 457. **Advanced Reactor Analysis.** Forms of the multigroup neutron transport and diffusion equations; analysis of heterogeneous reactors; direct numerical solution of the transport and diffusion equations; integral and coarse mesh methods; iterative solutions, convergence, and acceleration; synthesis methods; Monte Carlo methods for particle transport; and advanced topics. Prerequisite: Nuclear Engineering 455 or consent of instructor. 1 unit.
- 458. **Advanced Nuclear Engineering Design.** A classroom exercise in the conceptual design of a nuclear engineering system involving a synthesis of previous learning in the field of nuclear engineering and related disciplines; the design includes all necessary ingredients for the system, such as core, thermal- hydraulics, shielding, material selection, and control. Prerequisite: Five 300- and/or 400-level nuclear engineering courses including Nuclear Engineering 347 and 401, or equivalent; or consent of instructor. 1 unit.
- 460. **Reactor Kinetics and Dynamics.** Diffusion and transport neutron balances with delayed neutrons; formal development of the point reactor kinetics equations; analytic and numerical solutions of the point reactor kinetics equations; space- dependent, multigroup reactor kinetics; reactivity measurements; reactor noise analysis; and advanced topics. Prerequisite: Nuclear Engineering 455 or consent of instructor. 1 unit.
- 490. **Special Topics.** Considers selected areas of current interest in research which are not adequately covered in other courses. Prerequisite: Consent of instructor. 1/2 or 1 unit.
- 495. **Nuclear Engineering Problems.** Individual study in areas of nuclear engineering and closely related fields not covered by regular course offerings. The work is carried out under the supervision of a member of the faculty. Prerequisite: At least 3 units of graduate work; consent of instructor. 1/4 to 2 units.
- 497. **Seminar in Nuclear Science and Engineering.** Lectures and discussions on current work in research and development in nuclear engineering and related fields by staff, advanced students, and visiting lecturers. 0 or 1/4 unit.
- 499. **Thesis Research.** 0 to 4 units

NURSING

(Including General Nursing, Medical-Surgical Nursing, and Public Health Nursing)

Assistant Dean: Professor N. I. Komorita

Office: 1115 1/2 West Oregon, Urbana

The following courses are among the first to be offered in the College of Nursing R. N. Baccalaureate Completion Program on the Urbana-Champaign campus. Although these courses are part of the undergraduate program of the College of Nursing at the Medical Center campus, which has ultimate responsibility for them, under a cooperative arrangement they are being offered on the Urbana-Champaign campus as well.

NOTE: In the following courses, enrollment is limited to students who have senior standing in the College of Nursing R. N. Baccalaureate Completion Program.

General Nursing

- 292. **Trends and Issues in Nursing.** Exploration, reporting, and discussion of issues in nursing and related fields; effect of contemporary concepts and values on nursing today and on future development of the profession. 3 hours.
- 297. **Introduction to Research Methods.** Principles of scientific investigation; relationship of research design to nursing theory; sampling; data collection and analysis techniques; ethical issues. Application to critical examination of nursing research literature. Prerequisite: A course in introduction to statistics. 2 hours

Medical-Surgical Nursing

- 202. **Advanced Nursing Process.** Focuses on the nursing process as a basic tool of professional nursing practice; examines the basis of nursing practice in terms of concepts and theory as a means of organizing knowledge for nursing action; also presents concepts relative to skills of history taking and physical examination with laboratory & field experience. Prerequisite: Nursing 292 or consent of department. 3 hours.
- 204. **Nursing Concepts III.** Examines concepts related to organizational, management, and leadership theories and related processes applied to the health care and nursing care delivery systems. Prerequisite: Senior standing; concurrent registration in Nursing 205. 1 hour.
- 205. **Nursing Concepts III Practicum.** Application of the theoretical concepts of leadership and the management process as related to delivery of health care. Prerequisite: Senior standing; concurrent registration in Nursing 204. 1 hour.
- 223. **Medical-Surgical Nursing, II.** Studies concepts and principles of rehabilitation applied to the care of adults with long term, permanent, and progressive disabilities, emphasizing patients with neurological and musculoskeletal conditions; emphasizes the impact of disabilities on families and community systems. Prerequisite: Senior standing; concurrent registration in Nursing 224. 2 hours.
- 224. **Medical-Surgical Nursing II Practicum.** Applies concepts and principles of rehabilitation to the care of persons with long term, permanent, or progressive disabilities with emphasis on patients with neurological and musculoskeletal conditions; emphasizes patient and family teaching to foster optimal levels of functioning in the community. Prerequisite: Senior standing; concurrent registration in Nursing 223. 2 hours

Public Health Nursing

- 262. Public Health Nursing.** Concepts and principles needed to provide comprehensive health care to individuals and families in homes and community settings; functions of public health nursing in community assessment and community health planning. Prerequisite: Nursing 202, Health Education 374, or equivalent; concurrent registration in Nursing 263. 3 hours.
- 263. Public Health Nursing Practicum.** Gives students an opportunity to work with families and aggregates in the community, to apply newly acquired public health concepts, and to synthesize previously acquired nursing knowledge and skills. Prerequisite: Nursing 202; concurrent registration in Nursing 262. 3 hours

NUTRITIONAL SCIENCES

Acting Director: J. A. Milner

Program Office: 439 Bevier Hall, 905 S. Goodwin, Urbana

- 324. Biochemical Aspects of Human Nutrition.** Same as Food Science 324 and Foods and Nutrition 324. See Food Science 324.
- 400. Nutritional Sciences Seminar.** Discussions of current problems in nutritional sciences. Required of all graduate students in the nutritional sciences program. Prerequisite: Nutritional Sciences 410 and consent of instructor. 0 or 1/4 unit.
- 410. Current Topics in Nutritional Research.** Same as Dairy Science and Food Science 410. Discussion of current research problems in experimental nutrition. Prerequisite: Biochemistry 350 or 352; an upper-level course in nutrition. 3/4 unit.
- 411. Chemistry of Nutritional Processes.** Same as Dairy Science and Food Science 411. Biochemical aspects of nutrition with emphasis on the function, regulation, and metabolism of nutrients in man. Prerequisite: Biochemistry 350 or 352; an upper-level course in nutrition. 1 unit.
- 450. Problems in Clinical Nutrition.** Students meet weekly with University faculty and hospital clinical staff for rounds and tutorial-type discussions which evaluate the nutritional status of hospitalized patients and suggest appropriate nutritional management. Students write research proposals on specific problems or, by arrangement with the instructor, term papers on the nutritional management of a clinical problem. Prerequisite: Nutritional Sciences 410 and 411, or consent of instructor. 1/2 unit.
- 493. Individual Topics in Nutrition.** For students majoring in nutritional sciences who wish to undertake individual studies of a nonthesis nature in problems or topics not covered in other courses; may be taken under the direction of any member of the nutritional sciences faculty, with the exception of the student's own thesis adviser. Prerequisite: Consent of instructor. 1/4 to 2 units.
- 499. Thesis Research.** 0 to 4 units

PAINTING

(See Art and Design)

PERSIAN

(See Linguistics)

PHILOSOPHY

Chair of Department: Professor R. L. Schacht

Department Office: 105 Gregory Hall, 810 S. Wright, Urbana

NOTE: Students are urged to consult the detailed descriptions of all philosophy courses to be offered in particular semesters. These descriptions may be obtained in the department office at any time beginning one week prior to advance enrollment.

101. **Introduction to Philosophy.** Consideration of some main problems of philosophy concerning, for example, knowledge, God, mind and body, and human freedom. 3 hours.
102. **Logic and Reasoning.** A practical study of logical reasoning; techniques for analyzing and criticizing arguments, with emphasis on assessing the logical coherence of what we read and write. 3 hours.
103. **Ethics and Social Policy.** An examination of the moral aspects of social problems, and a survey of ethical principles formulated to validate social policy. Credit is not given for both Philosophy 103 and 105. 3 hours.
104. **Philosophy of Democracy.** An examination of the philosophical bases of democracy and some alternative political forms. 3 hours.
105. **Introduction to Ethics.** Some basic questions of ethics, discussed in the light of influential ethical theories and with reference to specific moral problems, such as: what makes an action morally right? are moral standards absolute or relative? what is the relation between personal morality and social morality, and between social morality and law? 3 hours. Credit is not given for both Philosophy 105 and 103.
110. **World Religions.** Same as Religious Studies 110. Survey of the leading living religions, including Hinduism, Buddhism, Taoism, Mohammedanism, Judaism, and Christianity; examination of basic texts and of philosophic theological elaborations of each religion. 3 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
198. **Freshman Seminar.** Investigation of selected fundamental topics of philosophical inquiry. See Timetable for current topics. Prerequisite: Freshman James Scholar. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Philosophy in Literature.** A consideration of the philosophical themes implicit in a variety of important literary works, both classical and modern; includes such authors as Sophocles, Shakespeare, Goethe, Dostoevsky, and Sartre. 3 hours.
202. **Symbolic Logic.** An introduction to the techniques of formal logic, dealing primarily with truth-functional logic and quantification theory. 3 hours.
203. **History of Ancient Philosophy.** An introduction to ancient philosophy, concentrating on Plato and Aristotle, dealing with such topics as metaphysics, ethics, and the theory of knowledge. 4 hours.
206. **History of Modern Philosophy.** The history of philosophy from Descartes to Kant. 4 hours.
207. **History of Modern Philosophy.** Bacon, Hobbes, Locke, Berkeley, and Hume. Philosophy 207 and 208 taken concurrently in the summer session are the equivalent of Philosophy 206. 2 hours. Offered in the summer session only.
208. **History of Modern Philosophy.** Descartes, Spinoza, Leibniz, and Kant. Philosophy 207 and 208 taken concurrently in the summer session are the equivalent of Philosophy 206. 2 hours. Offered in the summer session only.
210. **Ethics.** Problems in ethical theory; the nature of right and wrong, justice, conscience, moral feelings, etc. 3 hours.
214. **Moral Problems in Medicine and Biology.** A philosophical study of selected moral and social problems concerning medicine and biology, such as euthanasia,

- abortion, allocation of scarce medical resources, health care and rights, and genetic engineering. 3 hours.
225. **Recent European Philosophy.** Introduction to the major recent philosophical movements in Europe, such as phenomenology, existentialism, philosophical anthropology, and neo-Marxism. 3 hours.
230. **Philosophy of Religion: Introduction.** Same as Religious Studies 230. A critical study of theories about the nature of religion. 3 hours.
250. **Philosophical Conceptions of Human Nature.** A comparative examination of important historical and contemporary conceptions of human nature. 3 hours.
270. **Philosophy of Science.** Investigation of the nature of scientific knowledge by examining archetypal examples from physical science (e.g., Ptolemaic and Copernican astronomy); nature of scientific truth, validation of theories, nature of scientific theories, evolution of theories, experimental procedure, role of presuppositions, scientific revolutions, etc. 3 hours.
275. **Technology, Values, and the Future.** Examination of mutual influences of technology and science, social forces, and human values; sample topics include technological advances and "pure" science, role of interests and values in decisions to develop new technologies, evaluating and weighing costs of new technologies against projected benefits, and possible limits to growth; and case study. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
280. **Current Controversies.** Philosophical examination of positions taken on some issue of current concern, e.g., human sexuality, death and dying, feminism, race, intelligence, war, and sociobiology. See Timetable for current topics. 3 hours. May be repeated with consent of department Chair.
290. **Individual Study.** Readings in selected philosophical topics. This course may be taken by honors students in partial fulfillment of department honors requirements. Prerequisite: Open to juniors and seniors with a general grade-point average of 4.0 only by prior arrangement with a regular member of the staff and with consent of the Chair of the department. 2 to 4 hours. May be repeated for a maximum of 4 hours.
292. **Thesis.** Special training in philosophical investigation. This course may be taken by honors students in partial fulfillment of department honors requirements. Prerequisite: Open to seniors with a general grade-point average of 4.0 only by prior arrangement with a regular member of the staff and with consent of the chairman of the department. 2 to 4 hours. May be repeated for a maximum of 4 hours.
298. **Advanced Undergraduate Seminar.** Seminar on selected philosophical topics; intended primarily for advanced undergraduate philosophy concentrators. Prerequisite: A general grade-point average of 4.0 and consent of instructor. 3 hours. May be repeated to a maximum of 6 hours.
301. **Philosophy and Film.** Study of procedures for interpreting narrative films and evaluating specific interpretations, as well as an examination of philosophical issues raised in selected films. Prerequisite: One course in philosophy or in cinema studies. 4 hours or 1 unit.
304. **History of Medieval Philosophy.** The history of philosophy from St. Augustine to William of Ockham. Prerequisite: Philosophy 101 or 203. 3 hours, or 3/4 or 1 unit.
310. **Classical Ancient Philosophers.** An intensive study of one ancient philosopher or the intensive study of a major philosophical problem through the consideration of a number of ancient philosophers; chief emphasis on Plato and/or Aristotle. Prerequisite: One course in philosophy, preferably Philosophy 203. 3 hours, or 3/4 or 1 unit. May be repeated for credit with the consent of the Chair of the Department.
311. **Nineteenth Century Philosophy.** Examination of the thought of such major figures as Hegel, Marx, and Nietzsche. Prerequisite: One course in philosophy. 3 hours, or 3/4 or 1 unit.
312. **Classical Modern Philosophers.** Intensive study of one, or in special cases, two major philosophers of the period 1600- 1900, e.g., Descartes, Hume, Kant, or Hegel. Prerequisite: One course in philosophy. 3 hours, or 3/4 or 1 unit. May be repeated for credit.

313. **American Philosophy.** Examination of American philosophers from colonial to recent times, for example, Edwards, Peirce, James, Dewey. Prerequisite: One course in philosophy. 3 hours, or 3/4 or 1 unit.
314. **Major Recent Philosophers.** Intensive study of one or two important philosophers of the present century, e.g., Wittgenstein, Dewey, Heidegger, or Quine. Topic varies; see Timetable. Prerequisite: One course in philosophy. 3 hours, or 3/4 or 1 unit. May be repeated for credit as topic varies with consent of the department Chair.
316. **Anglo-American Philosophy Since 1900.** Introduction to the major philosophical developments in England and America in the present century, focusing on such writers as G. E. Moore, Bertrand Russell, A. J. Ayer, Ludwig Wittgenstein, and W. V. Quine. Prerequisite: One course in philosophy. 3 hours or 1 unit.
317. **Scientific Thought, I.** Same as History 339. A historical and critical survey of the development of science and its philosophical interpretation to the death of Newton. 3 hours or 1 unit.
318. **Scientific Thought, II.** Same as History 340. A historical and critical survey of the development of science and its philosophical interpretation from the death of Newton to the early twentieth century. Prerequisite: Philosophy 317. 3 hours or 1 unit.
319. **Space, Time, and Matter.** Same as Physics 319. See Physics 319.
321. **Ethics and Value Theory.** A systematic study of selected classics in moral philosophy by such philosophers as Aristotle, Hume, and Kant. Prerequisite: One course in philosophy. 3 hours, or 3/4 or 1 unit.
322. **Recent Developments in Ethics.** Intensive treatment of issues in contemporary ethical theory. Prerequisite: One course in ethics. 3 hours, or 3/4 or 1 unit. May be repeated for credit once with consent of the department Chair.
323. **Philosophy of Art.** Examination of philosophical interpretations of art and aesthetic experience by influential classical and recent writers. 3 hours, or 3/4 or 1 unit.
324. **Philosophy of Religion.** Same as Religious Studies 362. A critical consideration of central arguments in the philosophy of religion, both in their traditional forms and in their modern appearance: the justification of religious belief, the nature of God, religious experience, etc. Prerequisite: One course in philosophy. 3 hours, or 3/4 or 1 unit.
325. **Philosophy of Mind.** Philosophical problems arising in connection with mental phenomena; the relation of mind and body; free will and determinism; our knowledge of other minds; and the self and personal identity. Prerequisite: One course in philosophy. 3 hours, or 3/4 or 1 unit.
326. **Metaphysics.** Investigation of various metaphysical issues concerning, for example, existence, substance, particulars and universals, and space and time. Prerequisite: One course in philosophy. 3 hours, or 3/4 or 1 unit.
330. **Theory of Knowledge.** Investigation of issues concerning, for example, the nature and possibility of knowledge; its forms and limits; its relation to belief, truth, and justification; and the nature of truth. Prerequisite: One course in philosophy. 3 hours, or 3/4 or 1 unit.
331. **Analytic Philosophy.** Intensive study of works of important analytic philosophers, such as Wittgenstein, Austin, and Quine, on problems of knowledge, method, and other selected topics. Prerequisite: One course in philosophy. 3 hours, or 3/4 or 1 unit.
335. **Social Philosophy.** Selected topics from the nature of social organization, nature and convention, utility, justice, equality, liberty, rights, and duties. Prerequisite: Philosophy 103, 105, or 321, or consent of instructor. 3 hours, or 3/4 or 1 unit.
336. **Philosophy of Law and of the State.** Examination of issues in the philosophy of law, such as the nature of law, law and morality, justice, liberty and authority, punishment, and legal responsibility. Prerequisite: One course in philosophy. 3 hours, or 3/4 or 1 unit.
337. **Semantics.** An investigation of semantical concepts such as denoting and truth; a study of the functions of language; definition, meaning and verification, and semantical paradoxes. Prerequisite: A course in logic. 3 hours, or 3/4 or 1 unit.

338. **Philosophies of Language.** Same as Linguistics 338. A historical or comparative study of the philosophy of language. Prerequisite: One course in philosophy. 3 hours, or 3/4 or 1 unit.
339. **Philosophy of Mathematics.** Same as Mathematics 339. Introduction to some of the main philosophical problems and contemporary viewpoints concerning mathematical concepts, mathematical methods, and the nature of mathematical truths; the concept of infinity; conventionalism and formalism; the distinction between analytic and synthetic truths; necessity; mathematics and the problem of universals; and other related topics. Prerequisite: One course in philosophy. 3 hours, or 3/4 or 1 unit.
341. **Existential Philosophy.** Study of a selection of the major writings of the more important existential philosophers, e.g., Heidegger, Jaspers, and Sartre. Prerequisite: One course in philosophy (preferably Philosophy 225 or 311), or consent of instructor. 3 hours, or 3/4 or 1 unit.
343. **Phenomenology.** Study of the development of phenomenology from Husserl to the present. Prerequisite: One course in philosophy. 3 hours, or 3/4 or 1 unit.
344. **Topics in Phenomenology.** Examination of phenomenological treatments of selected phenomena, such as interpersonal relationships, emotions, the body, and perception; see Timetable for current topics. Prerequisite: Philosophy 225, 341, or 343, or consent of instructor. 3 hours, or 3/4 or 1 unit.
345. **Marxist Philosophy.** Examination of the philosophical writings of a number of Marxist writers, from Marx himself to such neo-Marxists as Schaff, Petrovic, Sartre, and Marcuse. 3 hours, or 3/4 or 1 unit.
347. **Post-Structuralist French Philosophy.** Intensive study of a selection of the major writings of recent French philosophers, such as Foucault and Derrida. Prerequisite: Philosophy 225, 341, or 343, or consent of instructor. 3 hours, or 3/4 or 1 unit.
353. **Formal Logic and Philosophy.** Techniques and results of symbolic logic, with special attention to topics of philosophical importance. Prerequisite: Philosophy 202, graduate standing, or consent of instructor. 3 hours, or 3/4 or 1 unit.
354. **Advanced Symbolic Logic.** Completeness, compactness, and Lowenheim-Skolem theorems for first-order logic; incompleteness and undecidability of formal systems; and additional material on proof theory, model theory, or axiomatic set theory as time permits. Prerequisite: Philosophy 202 or consent of instructor. 3 hours, or 3/4 or 1 unit.
361. **Comparative Religion.** Same as Religious Studies 361. A comparative study of classical high religions. 3 hours, or 3/4 or 1 unit.
363. **Contemporary Religious Thought.** Same as Religious Studies 369. An analysis of contemporary philosophical developments in Judaism, Christianity, and Islam, with particular emphasis upon "neoorthodox" Protestant thought. Prerequisite: One course in philosophy. 3 hours, or 3/4 or 1 unit.
371. **Philosophy of Science II: Contemporary Issues.** A comprehensive survey of the main developments in philosophy of science in this century; concentration on the views of logical positivism, subjectivism, and scientific realism; and topics including the nature of theories, laws and counter-factuals, inductive logic and confirmation theory, experimental methodology, concept formation, and scientific revolutions. Prerequisite: Philosophy 270 or consent of instructor. 3 hours or 1 unit.
375. **The Philosophy of Social Science.** Same as Anthropology 329 and Sociology 325. A survey of philosophical problems encountered in the disciplines concerned with man and society, with particular emphasis on the extent to which questions and subject matter in these fields are amenable to scientific treatment. 3 hours or 1 unit.
377. **Philosophy of Psychology.** A philosophical examination of the aims, methods, and structure of psychology, with special attention to such issues as the nature of explanations of behavior, the adequacy of behaviorism as a philosophy of psychology, and the place of the mind in psychological investigation. Prerequisite: Two courses in psychology, or consent of instructor. 3 hours or 1 unit.

- 401. **Seminar in the History of Philosophy.** Study of selected major philosophers, movements, problems, or topics in the history of philosophy; see Timetable for current topics. 1 unit. May be repeated for credit.
- 411. **Seminar in Ethical Theory.** 1 unit. May be repeated for credit.
- 412. **Seminar in Social Philosophy.** A seminar designed to study special problems in social philosophy. See Timetable for current topics. 1 unit. May be repeated for credit.
- 413. **Logical Theory.** Logical syntax and semantics. Prerequisite: A course in logic or consent of instructor. 1 unit. May be repeated for credit.
- 417. **Seminar in the Philosophy of Science.** Various problems arising from specific studies in philosophy pertaining to science and vice versa. To be offered with varying topics. 1 unit. May be repeated for credit.
- 420. **Seminar in Semantics.** Same as Communications 420. Intensive study of important contemporary contributions in the fields of semantics, analytic philosophy, and the philosophy of language. Prerequisite: Graduate standing in philosophy or equivalent. 1 unit. May be repeated for credit.
- 421. **Seminar in Contemporary Problems.** Intensive study of selected problems or topics in contemporary philosophy. 1 unit. May be repeated for credit.
- 423. **Seminar in the Theory of Knowledge.** Selected topics and writings of major importance in the contemporary philosophy of knowledge. 1 unit. May be repeated for credit.
- 425. **Seminar in the Philosophy of Mind.** Selected topics from major writings in the philosophy of mind. 1 unit. May be repeated for credit.
- 483. **Individual Topics.** Individual study and oral and written reports on topics not covered in other courses. Topics and plan of study must be approved by the candidate's adviser and by the staff member who directs the work. 1/2 or 1 unit (summer session, 1/2 to 2 units).
- 490. **Directed Research.** Restricted to students satisfying requirements for the master's degree by writing a substantial essay. Normally taken for two units credit but may be taken for three units credit with consent of department Chair. 0 to 3 units.
- 499. **Thesis Research.** 0 to 4 units

PHOTOGRAPHY

(See Art and Design)

PHYSICAL EDUCATION

Head of Department: Professor R. G. Wright

Department Office: 117 Freer Gymnasium, 906 S. Goodwin, Urbana

- 100. **Developmental Activities.** Skills and knowledge essential for leisure-time activities which are classified as developmental activities. Prerequisites for each developmental activity are given below. More than one activity (Sections A through H) may be taken in the same term. 1 to 2 hours

Section A: Conditioning and Weight Control. Activities and understanding which contribute to the development and/or maintenance of physical fitness and a well-proportioned body. 1 to 2 hours. May be repeated once for credit if taken in successive semesters; credit not to exceed a total of 2 hours.

Section B: Personal Defense. Skills and understanding essential for defense against an aggressor, with emphasis on avoiding attack. 1 hour.

Section C: Weight Training. Skills and knowledge essential for use of weights for conditioning the body. 1 hour. May be repeated once for credit if taken in successive semesters.

Section D: Physical Fitness. Activities and understanding which contribute to the development and maintenance of physical fitness according to social and hygienic standards. 1 hour. May be repeated once for credit if taken in successive semesters.

Section E: Prescribed Exercise. Prescribed exercise adapted to individual needs, capacities, and interests. Open only to paraplegic and handicapped students. 1 hour. May be repeated to a maximum of 4 hours.

Section F: Symbolism and Movement. Analysis of movement as a science and art, and as a symbolic form of communication; creative exploration of movement as a concomitant element of theater and the concert stage. 1 hour.

Section G: Foundations of Physical Activity. Activities and understanding of the human body relative to physical fitness and sport skill patterns. 1 hour.

Section H: Hatha Yoga. Introduction to Hatha Yoga, which is concerned with the physical well-being of the entire organism; includes a graduated program of postures (asanas), stretching movements, and muscular relaxation and breathing exercises. 1 hour.

Section I: Outdoor Adventures. Introductory skills and knowledge for development of life time activities in basic backpacking, basic river canoeing, and mountaineering techniques (balance climbing and rappelling). Includes participation in one field trip during the semester. Prerequisite: Physical Education 106A and 107A; or consent of instructor. 1 hour.

Section Z. Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

101. **Dance Activities.** Skills and knowledge essential for leisure-time activities which are classified as dance activities. Prerequisites for each dance activity are given below. More than one activity (Sections A through G) may be taken in the same term. 1 hour

Section A: Ballroom Dance, I. Introductory skills and understanding essential for ballroom dance, with emphasis on fox-trot, rhumba, lindy, waltz, cha-cha, and selected fad dances. 1 hour.

Section B: Ballroom Dance, II. Intermediate skills and understanding essential for ballroom dance, with emphasis on fox-trot, rhumba, lindy, waltz, and cha-cha as well as tango, samba, and paso doble. Prerequisite: Physical Education 101A or consent of instructor. 1 hour.

Section C: International Ballroom Dance. Skills and understanding essential for international ballroom dance steps; emphasis on tango, cha-cha, Viennese waltz, samba, rhumba, quickstep, paso doble, mambo, and merengue. Prerequisite: Physical Education 101B or consent of instructor. 1 hour.

Section D: American Square Dance. Introductory skills and understanding essential for square dancing; opportunities for conducting and calling dances. 1 hour.

Section E: International Folk Dance. Introductory skills, knowledge, and conditioning essential for exploring cultural characteristics via the folk dance idiom. 1 hour.

Section F: Modern Dance, I. Introductory skills, knowledge, and conditioning essential for free and creative dance. 1 hour.

Section G: Modern Dance, II. Intermediate level technique, improvisation, and composition for both men and women; multimedia approaches to dance and dance criticism. Prerequisite: Physical Education 101F or consent of instructor. 1 hour.

Section H: Afro-American Dance Forms. Beginning skills and knowledge and, under the repeat option, refined and more complex skills and heightened kinesthetic awareness essential for development of cultural characteristics via dance of West African, West Indian, Latin American, and contemporary Black American sources. 1 hour. May be repeated to a maximum of 3 hours.

Section Z. Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

- 102. Individual and Dual Activities.** Skills and knowledge essential for leisure-time activities which are classified as individual and dual activities. Prerequisites for each individual or dual activity are given below. More than one activity (Sections A through L) may be taken in the same term. 1 hour

Section A: Tennis, I. Introductory skills, knowledge, and conditioning essential for court play. 1 hour.

Section B: Tennis, II. Intermediate skills, knowledge, and attitudes for effective court play. Prerequisite: Physical Education 102A or consent of instructor. 1 hour.

Section C: Golf, I. Introductory skills and understanding essential for course play, with emphasis on irons. For current fees, see Timetable. 1 hour.

Section D: Golf, II. Intermediate skills and understanding essential for use of irons and woods; analysis of course play. For current fees, see Timetable. Prerequisite: Physical Education 102C or consent of instructor. 1 hour.

Section E: Bowling, I. Introductory skills and understanding essential for bowling. For current fees, see Timetable. 1 hour.

Section F: Bowling, II. Intermediate skills and understanding essential for bowling. For current fees, see Timetable. Prerequisite: Physical Education 102E or consent of instructor. 1 hour.

Section G: Equitation and Horsemanship, I. Fundamentals of riding, including walk, trot, and canter; flatsaddle and bareback riding; use of reins and tack; saddling and unsaddling; and basic grooming. For current fees, see Timetable. 1 hour.

Section H: Equitation and Horsemanship, II. Intermediate riding skills, including individual control of walk, trot, and canter; smooth transfer of gaits; bareback riding in all three gaits; diagonals, figure eights, and serpentine; and tack maintenance. For current fees, see Timetable. Prerequisite: Physical Education 102G or consent of instructor. 1 hour.

Section I: Foil Fencing. Introductory skills, knowledge, and conditioning essential for foil fencing. 1 hour.

Section J: Target Archery. Introductory skills, knowledge, and conditioning essential for target shooting. 1 hour.

Section K: Track and Field. Introductory skills, knowledge, and conditioning essential for various track and field events. 1 hour. May be repeated once for credit.

Section L: Wrestling. Introductory skills, knowledge, and conditioning essential for collegiate wrestling. 1 hour.

Section M: Pocket Billiards. An introduction to the fundamentals of pocket billiards play; grip, stance, bridge, strategy, variation of shots, how to impart English on the cue ball, basic position play, and an 8-ball tournament; and rules of various billiard games. For current fees, see Timetable. 1 hour.

Section N: Basic Marksmanship. Introductory skills, knowledge, and safety measures for basic marksmanship techniques with small bore weapons. 1 hour.

Section O: Competitive Marksmanship. Development of advanced competitive shooting skills; includes match weapons, description use, match procedures and match techniques. Prerequisite: Physical Education 102N. 1 hour.

Section Z. Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

- 103. Indoor Court Activities.** Skills and knowledge essential for leisure-time activities which are classified as indoor court activities. Prerequisites for each indoor court activity are given below. More than one activity (Sections A through E) may be taken in the same term. 1 hour

Section A: Racquetball, I. Introductory skills, knowledge, and strategies essential for racquetball. 1 hour.

Section B: Racquetball, II. Intermediate skills, knowledge, and strategies essential for racquetball. Prerequisite: Physical Education 103A or consent of instructor. 1 hour.

Section C: Badminton. Introductory skills, knowledge, and conditioning essential for badminton. 1 hour.

Section D: Handball. Introductory skills, knowledge, and conditioning essential for four-wall handball. 1 hour.

Section E: Squash Racquets. Introductory skills, knowledge, and conditioning essential for squash racquets. 1 hour.

Section Z: Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

104. **Skating Activities.** Skills and knowledge essential for leisure-time activities which are classified as skating activities. Prerequisites for each skating activity are given below. More than one activity (Sections A through E) may be taken in the same term. 1 hour

Section A: Figure Skating, I. Introductory skills, knowledge, and conditioning essential for figure skating. For current fees, see Timetable. 1 hour.

Section B: Figure Skating, II. Intermediate skills, knowledge, and conditioning essential for figure skating, with emphasis on skills to pass the United States Figure Skating Association's preliminary tests. For current fees, see Timetable. Prerequisite: Physical Education 104A or consent of instructor. 1 hour.

Section C: Figure Skating, III. Advanced skills, knowledge, and conditioning essential for figure skating, with emphasis on skills to pass the first eight tests of the United States Figure Skating Association. For current fees, see Timetable. Prerequisite: Physical Education 104B or consent of instructor. 1 hour.

Section D: Ice Hockey. Introductory skills, knowledge, and conditioning essential for ice hockey. For current fees, see Timetable. 1 hour.

Section E: Ice Dance. Introduction to set patterns of ice dance; emphasizes ice dance skills designed to build control in footwork and balance when skating with a partner. For current fees, see Timetable. Prerequisite: Physical Education 104B or consent of instructor. 1 hour. May be repeated to a maximum of 2 hours.

Section Z: Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

105. **Snow Activities.** Skills and knowledge essential for leisure-time activities which are classified as snow activities. Prerequisites for each snow activity are given below. More than one activity may be taken in the same term. 1 hour

Section A: Snow Skiing, I. Introductory skills, knowledge, and conditioning relative to snow skiing; practical experience will be accommodated at off-campus locations. For current fees, see Timetable. 1 hour. May be repeated to a maximum of 2 hours.

Section Z: Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

106. **Swimming Activities.** Skills and knowledge essential for leisure-time activities which are classified as swimming activities. Prerequisites for each swimming activity are given below. More than one activity (Sections A, B) may be taken in the same term if these activities are offered on an 8-week basis. 1 hour

Section A: Swimming, I. Introductory skills, knowledge, and conditioning essential for swimming. Open only to nonswimmers and those with no deep water experience. 1 hour. May be repeated once for credit.

Section B: Swimming, II. Intermediate skills, knowledge, and conditioning essential for swimming. Open only to swimmers who can execute a minimum of one of the five basic strokes in deep water, perform a standing dive, and tread in deep water. Prerequisite: Physical Education 106A or consent of instructor. 1 hour.

Section Z: Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

107. **Aquatic Sport Activities.** Skills and knowledge essential for leisure-time activities which are classified as aquatic sport activities. Prerequisites for each aquatic sport activity are given below. More than one activity (Sections A through G) may be taken in the same term. 1 hour

Section A: Canoeing. Introductory skills and knowledge essential for handling a canoe with safety. Prerequisite: Physical Education 106B or consent of instructor; the

ability to jump or dive into deep water while clothed and maintain a survival position for 10 minutes. 1 hour.

Section B: Competitive Swimming. Skills, knowledge, and conditioning essential for strokes, starts, and turns; emphasis on training for competitive participation as well as meet organization. Prerequisite: Physical Education 106B or consent of instructor. 1 hour.

Section C: Springboard Diving. Introductory skills, knowledge, and conditioning essential for springboard diving. Prerequisite: Physical Education 106B or consent of instructor. 1 unit. May be repeated once for credit.

Section D: Synchronized Swimming, I. Introductory skills, knowledge, and conditioning essential for creating aquatic compositions. Prerequisite: Physical Education 106B or consent of instructor. 1 hour.

Section E: Synchronized Swimming, II. Skills and knowledge at the intermediate level for creating aquatic compositions with an emphasis on choreography. Prerequisite: Physical Education 107D or consent of instructor. 1 hour.

Section F: Water Polo. Designed to develop skills, strategies, and knowledge essential for participation in the game of water polo. Prerequisite: Physical Education 107B or consent of instructor. 1 hour.

Section G: Angling. Introductory skills and understanding essential for bait, fly, and spin casting. 1 hour.

Section Z. Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

108. **Aquatic Certification Activities.** Skills and knowledge essential for leisure-time activities which are classified as aquatic certification activities. Prerequisites for each aquatic certification activity are given below. More than one activity (Sections A through D) may be taken in the same term. 2 hours

Section A: Scuba Diving, I. Introductory skills, knowledge, and conditioning essential for scuba diving. Includes only the pool and classroom sessions, not the open water dives required for certification; therefore, successful completion of this course does not result in certification. For current fees, see Timetable. Prerequisite: Physical Education 106B or equivalent with consent of instructor; medical certification required to use scuba apparatus. 2 hours.

Section B: Scuba Diving, II. Intermediate and advanced skills gained through dives at various off-campus locations. Successful completion of the course leads to an advanced diver's certification. For current fees, see Timetable. Prerequisite: Physical Education 108A or consent of instructor; medical certification required to use scuba apparatus. 2 hours.

Section C: Life Saving. American Red Cross training for the prevention of aquatic mishaps and for life saving. Prerequisite: Ability to swim one-half mile including 20 yards underwater and 100 yards of each of the following: sidestroke, breaststroke, and front crawl. 2 hours.

Section D: Water Safety Instructor Training. American Red Cross Instructor training for the teaching of swimming and life saving. Prerequisite: American Red Cross Swimmer and Advanced Life Saving certificates (current), and consent of instructor. 2 hours.

Section Z. Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

109. **Team Sport Activities.** Skills and knowledge essential for leisure-time activities which are classified as team sport activities. Prerequisites for each team sport activity are given below. More than one activity (Sections A through L) may be taken in the same term. 1 hour

Section A: Volleyball, I. Introductory skills, knowledge, and conditioning essential for power volleyball. 1 hour.

Section B: Volleyball, II. Intermediate skills, knowledge, and conditioning essential for power volleyball. Prerequisite: Physical Education 109A or consent of instructor. 1 hour.

Section C: Basketball. Introductory skills, knowledge, and conditioning essential for basketball. 1 hour.

Section D: Tackle Football, I. Introductory skills, knowledge, and conditioning for tackle football. 1 hour.

Section E: Tackle Football, II. Intermediate and advanced skills and knowledge for tackle football; emphasizes team formations and strategies. Prerequisite: Physical Education 109D or consent of instructor. 1 hour. May be repeated to a maximum of 2 hours.

Section F: Baseball, I. Introductory skills, knowledge, and conditioning for baseball. 1 hour.

Section G: Baseball, II. Intermediate and advanced skills, knowledge, and conditioning for baseball. Prerequisite: Physical Education 109F or consent of instructor. 1 hour. May be repeated to a maximum of 2 hours.

Section H: Soccer. Introductory skills, knowledge, and conditioning essential for soccer. 1 hour.

Section I: Rugby Football. Introductory skills, knowledge, and conditioning essential for offensive and defensive strategies of the game. 1 hour.

Section J: Field Hockey. Introductory skills, knowledge, and conditioning essential for field hockey. 1 hour.

Section K: Lacrosse. Introductory skills, knowledge, and conditioning essential for lacrosse. 1 hour.

Section L: Speedball and Speedaway. Introductory skills, knowledge, and conditioning necessary for speedball and speedaway. 1 hour.

Section Z. Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

110. **Gymnastic Activities.** Skills and knowledge essential for leisure-time activities which are classified as gymnastic activities. Prerequisites for each gymnastic activity are given below. More than one activity (Sections A through E) may be taken in the same term. 1 hour

Section A: Apparatus, I. Introductory skills, knowledge, and conditioning relative to participation on heavy apparatus. 1 hour.

Section B: Apparatus, II. Intermediate skills, knowledge, and conditioning relative to participation on heavy apparatus. Prerequisite: Physical Education 110A or consent of instructor. 1 hour.

Section C: Tumbling. Introductory skills, knowledge, and conditioning for tumbling and free exercise. 1 hour. May be repeated once for credit.

Section D: Rhythmic Gymnastics. Dynamic rhythmic movement interpretation by individual and group structure; utilization of hand apparatus (balls, hoops, ropes, etc.). 1 hour. May be repeated once for credit.

Section E: Trampoline. Introductory skills, knowledge, and conditioning relative to trampolining and tumbling. 1 hour.

Section Z. Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

120. **Injuries in Sport.** Emphasizes injury mechanisms, means of injury prevention, and emergency care applied to various types of sport injuries; laboratory sessions emphasize preventive and therapeutic taping and emergency first aid. 2 hours.
130. **Analysis and Performance of Basic Movement Skills.** Development of an understanding of basic movement skills; emphasizes performance and qualitative analysis of personal movement skills; and studies developmental aspects of typical and atypical movement skills in a variety of settings. 2 hours.
131. **Movement Skills: Fitness.** Development of and participation in a physical fitness program including physical fitness assessment. 1 hour.
132. **Movement Skills: Swimming.** Development of an understanding of basic swimming skills; emphasizes performance and qualitative analysis of personal aquatic skills, developmental aspects of aquatic skills, and analysis of atypical movement patterns in an aquatic environment. Prerequisite: Physical Education 130,

- and ability to execute a minimum of one of five basic strokes in deep water, perform a standing dive, and tread in deep water. 1 hour.
133. **Movement Skills: Dance.** Development of an understanding of basic dance steps, positions and sequences; emphasizes performance and qualitative analysis of personal dance skills, developmental aspects of dance and rhythm, and analysis of atypical movement patterns in a dance setting. Prerequisite: Physical Education 130. 1 hour.
134. **Movement Skills: Gymnastics.** Development of an understanding of basic gymnastic movements and sequences; emphasizes performance and qualitative analysis of personal gymnastic skills, developmental aspects of gymnastic skills, and analysis of atypical movement patterns in a gymnastic setting. Prerequisite: Physical Education 130. 1 hour.
135. **Movement Skills: Field Activities.** Development of an understanding of basic field activity skills; emphasizes performance, as well as an appreciation of commonalities, in specific activities including soccer, speedball, speedway, field hockey and flag football. Prerequisite: Physical Education 130. 1 hour.
136. **Movement Skills: Racquet Activities.** Development of an understanding of basic racquet activity skills; emphasizes performance, as well as appreciation of commonalities in specific racquet activities such as tennis, badminton, squash or racquetball. Prerequisite: Physical Education 130. 1 hour.
140. **Social Scientific Bases of Sport.** Introduction to the social science aspects of physical education and sport; particular emphasis on concepts derived from the social sciences (including psychology) that are appropriate to physical education and sport. 3 hours.
141. **Sports in Greece and Rome.** Same as Classical Civilization 150. See Classical Civilization 150.
150. **Bioscientific Foundations of Human Movement.** Integrates anatomical and physiological aspects of human movement; emphasizes how the body moves, physiological responses to exercise stress, physical conditioning and physical fitness. 3 hours.
160. **Physical Education as a Profession.** The nature and scope of physical education as a profession; emphasis on orientation to the profession as well as understanding necessary for selecting an area of specialization within physical education. 2 hours.
161. **Principles of Motor Skill Acquisition.** Studies the basic principles of learning motor skills and their application in physical activities. Prerequisite: Physical Education 130, or consent of instructor. 3 hours.
171. **Introduction to Sports Officiating.** Introduction to the fundamentals of sports officiating; a lecture course designed to foster the development of a sound knowledge of rules and an understanding of the mechanics involved in officiating selected sports. Content focuses upon those sports in season according to student demand and available faculty expertise; specific sports are announced in the Timetable. Each section is offered for eight weeks. 1 hour. May be repeated as specific activity varies.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
220. **Fundamentals of Athletic Training.** Discusses the role of the athletic trainer: legalities, facilities, advanced emergency procedures, and injury prevention; emphasizes the understanding of the process of injury and healing as a basis for prevention and treatment of injuries. Laboratory sessions stress special taping, emergency procedures and equipment. Prerequisite: Physiology 103 and 234, Physical Education 120, or consent of instructor. 2 hours.
222. **Bases for Prescription of Therapeutic Exercises.** Functional anatomy and injury constraints as a bases for prescription of therapeutic exercises for musculoskeletal conditions; laboratory sessions stress clinical evaluation of muscle and joint function and familiarization with therapeutic exercises. Prerequisite: Physiology 103 and 234. 3 hours.
230. **Coaching Strategies: Basketball.** Examination of strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching basketball. 2 hours.

- 231. Coaching Strategies: Tackle Football.** Examination of strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching tackle football. 2 hours.
- 232. Coaching Strategies: Baseball/Softball.** Examination of strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching baseball/softball. 2 hours.
- 233. Coaching Strategies: Track and Field/Cross Country.** Examination of strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching track and field/cross country. 2 hours.
- 234. Coaching Strategies: Volleyball.** Examination of strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching volleyball. 2 hours.
- 235. Coaching Strategies: Gymnastics.** Examination of strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching gymnastics. 2 hours.
- 236. Coaching Strategies: Swimming/Diving.** Examination of strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching swimming/diving. 2 hours.
- 237. Coaching Strategies: Tennis/Badminton.** Examination of strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching tennis/badminton. 2 hours.
- 238. Coaching Strategies: Soccer.** Examination of strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching soccer. 2 hours.
- 241. History of Sport.** Deals principally with the social, cultural, and economic aspects of the sport movement in the Western world; secondary emphasis on methods of historical research. 3 hours.
- 244. Anthropology of Play.** Same as Anthropology 244. The study of human play with emphasis on origin, diffusion, spontaneity, emergence, and diversity; includes functions of play in selected culture groups. Prerequisite: A course in anthropology. 3 hours.
- 247. Introduction to Sport Psychology.** An analysis of the competitive sport process, with study of how personality and situational variables affect motivation, anxiety, and aggression in sport. Attention is given to the psychological skills needed by coaches and athletes for successful and enjoyable sports participation. Prerequisite: Physical Education 140, or an introductory psychology course. 3 hours.
- 249. Sport and Modern Society.** Same as Sociology 249. The sociological analysis of sport in modern societies with regard to social class, politics, community, education, and collective behavior. 3 hours.
- 251. Analysis of Physical Fitness Programs.** Introduction to the physiological adaptations of the body during physical conditioning; analysis and development of physical fitness programs for individuals and groups. Prerequisite: Physical Education 150 or consent of instructor. 2 hours.
- 255. Kinesiology.** Studies the biological and mechanical principles of human motor performance; analyzes selected movement skills in depth. Prerequisite: Physiology 103, 234, Mathematics 111, or consent of instructor. 3 hours.
- 257. Introduction to Motor Learning.** A lecture/laboratory course surveying the basic variables and mechanisms governing motor learning and control; emphasizes experimental methods, research findings, and theory. Prerequisite: Physical Education 140 and 161, or consent of instructor. 3 hours.

262. **Motor Development in Childhood.** Same as Human Development and Family Ecology 204. Study of the selection of specific movement experiences for the elicitation and maintenance of developmental sequences in children and youths based on physical growth and motor development; observational experiences provided with children in a variety of settings. Prerequisite: Physical Education 150 or Human Development and Family Ecology 105. 3 hours.
263. **Physical Education Curriculum.** The identification, selection, and organization of movement knowledges and experiences into curricula for children and youth; emphasizes the decision-making process in curriculum development. Prerequisite: Junior standing. 3 hours.
264. **Organization and Administration of Physical Education.** The scope of this course is concerned with the organization and administration of a total physical education program, including administrative philosophy; the physical education program; physical education staff, facilities, and equipment; the budgetary process; legal liability; discipline; and public relations. 3 hours.
266. **Basic Movement and Body Mechanics.** Experiences, skills, and knowledge relative to structure and function of the human body in selected physical education and dance activities. 1 hour.
267. **Adapted Physical Education.** Organization, administration, and conduct of physical education programs for the most prevalent types of medical conditions found in school settings; emphasis on analyzing motoric needs and prescribing programs of motor activity for special populations, including individuals with mental retardation and learning disabilities. Prerequisite: Physical Education 150 and 161, or consent of instructor. 3 hours.
269. **Physical Education for Children.** Theory and practice of physical education in preelementary and elementary schools; for non-physical education majors. 3 hours.
270. **Theory of Coaching.** Basketball, football, and baseball schedule making; team management; scouting; and officiating. Prerequisite: Consent of instructor. 2 hours.
271. **Administration of High School Sport Programs.** Organization of sports programs, team sports, intramural programs, and recreational sports programs. 3 hours.
272. **Organization of Aquatic Programs.** Same as Leisure Studies 272. History of aquatics; leadership training methods; swimming pool sanitation; pool and beach control; and operational records. 2 hours.
273. **Instructional Strategies in Physical Education.** Analyzes the teaching-learning process, emphasizing the identification of instructional strategies specific to the development of skilled performance in movement activities. Prerequisite: Physical Education 161. 3 hours.
274. **Instructional Strategies for Children.** The application of instructional strategies for the motor development of elementary and pre-school children. Prerequisite: Physical Education 262 and 273. 3 hours.
275. **Instructional Strategies for Adolescents and Adults.** The application of instructional strategies for the motor development of adolescents and adults. Prerequisite: Physical Education 273. 3 hours.
280. **Principles of Evaluation and Assessment.** An introduction to the methods and techniques of evaluation and assessment of human performance in physical education and sport. Prerequisite: Physical Education 160; Mathematics 111 or 112, or equivalent score on the Mathematics Placement Test. 3 hours.
285. **Supervised Experiences in Physical Education Research.** Supervised laboratory experiences in physical education research; individual work under the supervision of members of the faculty in their respective fields. The student assists with data collection, processing, and analysis for research in progress. Prerequisite: Physical Education 160 or consent of instructor. 3 hours. May be repeated to a maximum of 6 hours.
286. **Supervised Experience in the Common School.** Supervised practice in observing, assisting, and teaching children in preelementary school, elementary school, junior high school, and senior high school; emphasis on understanding motor behavior, teacher-learner behavior, and interrelatedness with other aspects of the learning

- environment. Prerequisite: Physical Education 161 or equivalent. 3 hours. May be repeated for a maximum of 6 hours.
287. **Supervised Experiences in the Agency Setting.** Supervised practical experience in physical education leadership roles in nonschool agency settings; emphasis on observing, planning, and conducting physical activity programs for children and/or adults in preschool, recreation, or other social agencies. 3 hours. May be repeated for a maximum of 6 hours.
290. **Honors Seminar.** Same as Health Education 260 and Leisure Studies 260. Lectures and discussion dealing with issues in physical education, dance, health education, recreation education, and related fields. Prerequisite: James Scholar standing or grade-point average of 4.0. 2 hours. May be repeated for a maximum of 6 hours.
291. **Special Problems.** Special projects in research and independent investigation in any phase of health, physical education, recreation, and related areas selected by the students. Prerequisite: Junior or senior standing; grade-point average of 3.5; consent of faculty advisor, instructor, and head of department. 2 or 3 hours. May be repeated for a maximum of 4 to 6 hours.
295. **Advanced Wrestling.** Designed to review the basic skills and to introduce more advanced wrestling techniques and strategies, thereby preparing better qualified wrestling instructors and coaches for the various educational levels. Prerequisite: Consent of instructor. 2 hours.
305. **Principles of Ergonomics.** Same as Industrial Engineering and Physiology 305. See Industrial Engineering 305.
320. **Advanced Assessment of Athletic Injuries.** Analyzes injury patterns and mechanisms for the various joints and body segments; emphasizes the nature of the injuries, clinical evaluation and therapeutic principles, on the physiology of the healing process, and functional anatomy. Prerequisite: Physical Education 220, or consent of instructor. 3 hours or 1 unit.
321. **Therapeutic Modalities in Athletic Training.** Emphasizes instrumentation and application of therapeutic modalities in laboratory settings: therapeutic heat, electrotherapy, traction, massage, and hydrotherapy. Prerequisite: Credit or concurrent registration in Physical Education 320, or consent of instructor; Physics 140 is recommended. 2 hours or 1/2 unit.
322. **Neurophysiological Bases of Therapeutic Exercise.** Examines neurological mechanisms underlying exercise performance with application to therapeutic programs. Prerequisite: Physiology 103 or 234, or equivalent. 4 hours or 1 unit.
348. **Social Problems Related to Physical Activity and Sport.** Same as Leisure Studies 348. A seminar with field study on physical activity and sport for marginal, deviant, or sociopsychologically deprived groups. Prerequisite: Six hours in the social sciences or consent of the instructor. 2 hours, or 1/2 or 1 unit.
349. **Analysis of Small Groups in Play or Sport.** Same as Leisure Studies 349. The methodology of small group research and analysis of the small group in play and sport; culture, social structure, and personality structure in the group; and class and student observation and analysis of the small group in play and sport in natural field settings. Prerequisite: Psychology 100 or 201, or Sociology 100 or 201, or consent of instructor. 2 or 4 hours, or 1/2 or 1 unit.
352. **Physiology of Physical Activity.** Study of the immediate and long-term physiological effects of exercise upon the body; mechanisms of neuromuscular, cardiorespiratory, and metabolic control and adaptation relative to physical activity. Laboratory and lecture. Prerequisite: Physical Education 150; Physiology 103 and 234; or equivalent. 3 hours or 1 unit.
354. **Growth and Physical Development of Children.** Same as Human Development and Family Ecology 354. A study of the growth and physical development of children through adolescence with emphasis on those systems and body composition changes related to motor performance and exercise stress. Prerequisite: Physiology 103 and 234; Physical Education 280; or equivalent. 3 hours or 1 unit.

355. **Cinematography in Kinesiology.** Designed to develop an understanding of the mechanics of human motion as related to performance in sport activities through the mode of cinematography. Prerequisite: Physical Education 255, or consent of instructor. 3 hours or 1 unit.
356. **Electromyographic Kinesiology.** Focuses upon the biological components of volitional and reflexive movement in humans; theory and technology of electromyography are utilized to describe and quantify the neuromuscular input to the mechanical output. Prerequisite: Physiology 103 and 234. 3 hours or 1 unit.
357. **Motor Learning.** Discussion and analysis of scientific principles related to the learning and performance of motor skills; review of related literature and research in motor learning. Prerequisite: Psychology 100 or consent of instructor. 4 hours or 1 unit.
363. **Curriculum Development and Trends.** Curriculum planning and development in physical education with emphasis on ecological, biological, psychological, and sociological factors influencing programs in schools and colleges. Prerequisite: Physical Education 264 or consent of instructor. 4 hours or 1 unit.
364. **Problems of Facilities Planning, Construction, and Utilization.** Physical education facilities as related to objectives of physical education; consultant services with planning committees and architects; cost factors in different types of construction; the use of standards as a check on and guide for planning; safety factors; changes in playing surfaces due to research; and building and fields maintenance programs. Prerequisite: Physical Education 264 or equivalent, or consent of instructor. 2 hours, or 1/2 or 1 unit.
365. **Movement Notation.** Same as Dance 349 and Psychology 312. Scientific symbolic system for notation of movements of the human body. Prerequisite: Physical Education 150 or 255, or Dance 160. 3 hours or 1 unit.
394. **Special Topics in Physical Education.** Lecture course on topics of current interest; specific topics announced in the Timetable. Prerequisite: To be determined for each subject and indicated in the Timetable. 1 to 4 hours, or 1/4 to 1 unit. May be repeated.
440. **History of Physical Education and Sport.** An analysis of the research literature related to the historical foundations of physical education and sport; discussion of such persistent historical problems as the influence of economics, politics, and nationalism; curriculum and methods of instruction; professional preparation; the healthy body; dance; the use of leisure; and amateur and professional sport. Prerequisite: Physical Education 241 or equivalent. 1 unit.
441. **Philosophy of Physical Education and Sport.** Philosophical analysis of physical education and sport (with some reference to school health and recreation) in the light of the leading philosophical tendencies and possible implications for public and private education; analysis of completed research; and delineation of one's personal philosophy and the use of philosophical analysis as a research technique. Prerequisite: Philosophy 101; Educational Policy Studies 305. 1 unit.
447. **Sport Psychology.** Analysis of psychological factors and principles with special reference to motor performance, learning motor skills, perception, and emotion in sports situations; review of literature; and independent projects. Prerequisite: Psychology 100; Educational Psychology 211; consent of instructor. 1 unit.
449. **The Sociology of Sport.** Same as Sociology 449. Sociological analysis of sport with emphasis on sociological theory; sport and games in cross-cultural analysis; sport's structure and function in modern industrialized society; the system of sport in regard to its role structure, formal organization, and professionalization; its differentiation along social class, age, and sex; and sport contest and conflict. Prerequisite: Nine hours of sociology or anthropology including a course in research methods, or consent of instructor. 1 unit.
451. **Scientific Basis of Physical Performance.** Contemporary trends in the study of human performance and exercise stress; analysis of the research literature, experimental strategies, and research instrumentation. Lecture-discussion and laboratory. Prerequisite: Physical Education 352 or 354, or equivalent. 1 unit.

452. **Neuromuscular Aspects of Human Performance.** In-depth study of the neuromuscular aspects of human activity; focus on selected topics related to growth, physical development, exercise prescriptions, athletic conditioning, and fitness. Lecture-discussion and laboratory. Prerequisite: Physical Education 451. 1 unit.
453. **Circulorespiratory Aspects of Physical Activity.** Aerobic performance responses to short-term, intermittent, and prolonged physical activity; special consideration given to endurance training methods and assessment techniques, ergogenic aids, and problems associated with growth, environmental influences, and competitive sport. Lecture-discussion and laboratory. Prerequisite: Physical Education 451 or consent of instructor. 1 unit.
455. **Experimental Kinesiology.** Mechanical and neuromuscular approach to human movement; analysis, experimental research findings, and lecture and laboratory discussions. Prerequisite: Physical Education 355 and 356, or consent of instructor. 1 unit.
457. **Sensorimotor Development.** Same as Human Development and Family Ecology 457. Study of the development of spatially adapted movement behavior in man; emphasis on the nature of sensorimotor systems and development of perception; the role of proprioceptive feedback mechanisms and associated reflexes; and the neurogeometric principles basic to the study of man interpreting and acting on the environment. Prerequisite: Physical Education 357 or equivalent. 1 unit.
459. **Principles of Kinesiotherapy.** Analysis of medically approved techniques employed in the treatment of disease and injury by exercise and movement; kinesiological evaluation of principles involved; therapy preparation in teaching techniques; medically prescribed clinical training; and literature and research. Prerequisite: Physiology 234; Physical Education 150 and 255; or consent of instructor. 1 unit.
461. **Administration of Physical Education and Sport.** Analysis of completed research relating to theory and practice of administration in physical education and sport; the development of policy statements and procedures manuals for the various educational levels; and experience in the use of the case plan of instruction as a teaching technique for the development of competence and knowledge relating to human relations and administration in this specialized field. Prerequisite: Physical Education 264 or equivalent. 1 unit.
473. **Ergonomics Seminar.** Same as Industrial Engineering 473 and Physiology 473. See Industrial Engineering 473.
490. **Seminar.** Lectures, discussions, and critiques on physical education and related subjects by faculty members and visiting professional leaders; presentation and criticism of student theses. 0 credit.
493. **Independent Study.** Independent research on special projects; offered summers as a special group practicum. 1/2 or 1 unit.
494. **Special Topics in Physical Education.** Lecture course in topics of current interest; specific subject matter announced in the Timetable. 1/2 or 1 unit. May be repeated.
495. **Techniques of Research in Health, Physical Education, and Recreation.** Review and appraisal of common research procedures; application of statistical procedures, library methods, evaluation procedures, and experimental methods. 1 unit.
499. **Thesis Research.** Preparation of theses in physical education. 0 to 4 units

PHYSICS

Head of Department: Professor R. O. Simmons

Department Office: 211 Loomis Laboratory of Physics, 1110 W. Green, Urbana

101. **General Physics (Mechanics, Heat, and Sound).** Lectures with demonstrations, recitations, and laboratory. For students in arts and sciences, architecture, agriculture, and veterinary medicine. Prerequisite: Trigonometry. 5 hours.

102. **General Physics (Light, Electricity, and Magnetism).** Lectures with demonstrations, recitations, and laboratory. For students in arts and sciences, architecture, agriculture, and veterinary medicine. Prerequisite: Physics 101. 5 hours.
106. **General Physics (Mechanics).** Lectures with demonstrations, recitations, and laboratory. For students in engineering, mathematics, physics, and chemistry. Prerequisite: Mathematics 120; credit or concurrent registration in Mathematics 130 or 131. 4 hours.
107. **General Physics (Heat, Electricity, and Magnetism).** Lectures with demonstrations, recitations, and laboratory. For students in engineering, mathematics, physics, and chemistry. Prerequisite: Physics 106; credit or concurrent registration in Mathematics 240 or 241. 4 hours.
108. **General Physics (Wave Motion, Sound, Light, and Modern Physics).** Lectures with demonstrations, recitations, and laboratory. For students in engineering, mathematics, physics, and chemistry. Prerequisite: Physics 107; credit or concurrent registration in Mathematics 240 or 241. 4 hours.
140. **Practical Physics: How Things Work--A Course for Nonscientists.** A nonmathematical lecture-demonstration course for nonscience students, underscoring the generality and ubiquity of basic physical laws in understanding commonplace phenomena: musical instruments, photography, electric and electronic circuits, television, motors, engines, etc. 3 hours. No credit for students in the College of Engineering.
141. **Special Problems.** Special problems in physics: discussions and independent study. Supplement to Physics 140. Prerequisite: Credit or concurrent registration in Physics 140. 1 hour.
150. **Physics and the Modern World: A Course for Nonscientists.** A nonmathematical lecture course attempting to bridge the two- culture gap; takes examples from modern physics: relativity, elementary particles, quantum theory, statistics, etc., and covers basic philosophical concepts in physics which pervade all human disciplines: model-making, dynamics, ensemble behavior, and symmetry. 3 hours.
151. **Special Problems.** Special problems in physics: discussions and independent study. Supplement to Physics 150. Prerequisite: Credit or concurrent registration in Physics 150. 1 hour.
170. **Physics of Photography.** Designed to enable nonscience students to understand photography. The nature of light, including reflection and refraction; how lenses work and why they are imperfect; the formation of the latent image in the film and the development of the image; light sources; color photography; special topics. Includes laboratory experiments. Prerequisite: High school algebra and geometry. 4 hours. No credit for students in the College of Engineering.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
210. **Introductory Relativity.** Lecture A (first 5 weeks) treats the special relativistic view of space and time, as well as relativistic momentum and energy; Lecture B (second 5 weeks) treats basic aspects of general relativity; Lecture C (last 5 weeks) covers the four-vector formalism of special relativity, as well as special relativistic aspects of electricity and magnetism. Prerequisite: (For every lecture) Physics 101 or 106; Lecture C also requires concurrent registration in Physics 102 or 107. No advanced mathematics is required, but facility with ordinary algebra is demanded. 1 to 3 hours.
302. **Principles of Atmospheric Dynamics.** Same as Atmospheric Sciences 302. See Atmospheric Sciences 302.
303. **Modern Experimental Physics, I.** Techniques and experiments in the physics of atoms, atomic nuclei, molecules, the solid state, and other areas of modern physical research. Prerequisite: Physics 333; registration in Physics 386. 3 to 5 hours, or 1/2 to 1 unit. Students taking the course for the first time must register for 5 hours or 1 unit. Those repeating the course may do so for variable credit of 3 to 5 hours, or 1/2 to 1 unit.
319. **Space, Time, and Matter.** Same as Philosophy 319. A philosophical examination of some fundamental concepts and theories of the physical world, such as time,

- matter, causation, space, and geometry; interpretation of quantum theory. Graduate students write an additional paper. Prerequisite: Junior standing, one physical science course, and one of the following: Physics 108 or Philosophy 101, 270, or 317; alternatively, consent of instructor. 3 hours or 1 unit.
331. **Intermediate Electricity and Mechanics.** Studies linear systems: electrostatics, electric circuits, mechanical oscillators; free and driven motion, a-c and transient behavior, linear response theory; filters, one-dimensional lattices, transition from discrete to continuous systems, strings, and transmission lines. Involves lectures, problems, and laboratory. Prerequisite: Two semesters of general physics, concurrent registration in Mathematics 341 or 345, and in Physics 108; or consent of instructor. 5 hours, or 3/4 or 1 unit (3/4 unit without laboratory). No graduate credit given to physics majors.
332. **Classical Mechanics.** Examines particle motion in two and three dimensions including planets and satellites, conservation laws for systems of particles, accelerated reference frames, rigid bodies in three dimensions, Newtonian gravitation, fluid flow, generalized coordinates, Lagrange's equations, normal modes, and phase space. Prerequisite: Physics 331, Mathematics 341 or 345, and concurrent registration in Mathematics 343; or consent of instructor. 4 hours or 1 unit.
333. **Electromagnetic Fields.** Electrostatics, magnetostatics (including slowly varying currents); electromagnetic induction; energy and forces; Maxwell's equations; electromagnetic wave propagation, reflection and transmission; waveguides and cavities; radiation from dipoles and slow particles. Lectures, problems and laboratory. Prerequisite: Physics 331, Mathematics 341 or 345, and Mathematics 343. 5 hours, or 3/4 or 1 unit (3/4 unit without laboratory).
343. **Electronic Circuits, I.** The physics of semiconductor devices; theory and application of discrete and integrated devices in linear circuits; use of operational amplifiers and feedback; regulation, oscillators, and modulation; emphasis on practical experience. Lectures, problems, and laboratory. Prerequisite: Physics 331 or consent of instructor. 5 hours or 1 unit.
344. **Electronic Circuits, II.** Continuation of Physics 343 with particular emphasis on nonlinear devices, switching circuits, digital logic, analog to digital and digital to analog conversion, and individual projects. Lectures, problems, and laboratory. Prerequisite: Physics 343 or consent of instructor. 5 hours or 1 unit.
346. **Modern Physics for Nuclear Engineers.** Same as Nuclear Engineering 346. Those fundamentals of quantum theory, atomic structure, and nuclear behavior needed by students before taking advanced courses in nuclear engineering; basic information on radiation types, properties, and interactions. Prerequisite: Junior standing in engineering or physical science. 3 hours or 3/4 unit. Not available for graduate credit to nuclear engineering students.
350. **Biomolecular Physics.** Same as Biophysics 350. The physical concepts governing structure and function of biological macromolecules. Static and dynamical properties of proteins and nucleic acids; interaction with other molecules; catalysis and regulation. Emphasizes physical methods of approach to problems of current research interest; designed for students without any appreciable background in biology and chemistry. Prerequisite: Chemistry 102 or equivalent, Physics 383 or 387 or equivalent, or consent of instructor. 4 hours or 1 unit.
361. **Thermodynamics and Statistical Mechanics.** A course in statistical and thermal physics designed primarily for advanced undergraduates; topics include equilibrium thermodynamics, statistical mechanics, and kinetic theory of gases. A unified treatment is used in that the principles of heat and thermodynamics are discussed along with statistical postulates and the microscopic approach of introductory quantum mechanics. Prerequisite: Two 300-level courses in physics or consent of instructor. 4 hours or 1 unit. Credit may not be earned in both Physics 361 and Mechanical Engineering 301, Chemistry 342 and 344, and Metallurgical Engineering 420.
365. **Introduction to Plasma Physics.** Physical concepts underlying the description of ionized gases; individual particle and continuum models; collision processes in

- plasmas; charged particle motion in electromagnetic fields; waves in cold plasmas; elementary treatment of collective plasma behavior; simple plasma instabilities; selected topics of current interest. Prerequisite: Electrical Engineering 350 or Physics 333, or consent of instructor. 4 hours or 1 unit.
371. **Light.** Wave kinematics; geometrical optics: basic concepts, ray-tracing and matrix formalism, Gaussian imaging by thick lenses, stops, and apertures, and intensity relations; interference; interference spectroscopy and coherence; diffraction: Fresnel-Kirchhoff formulation, Fraunhofer case, Fresnel case, and holography; polarized light. Lectures, laboratory, and problems. Prerequisite: Physics 101 and 102, or Physics 106, 107, and 108; Mathematics 345; or consent of instructor. 4 hours, or 1/2 or 1 unit.
382. **Subatomic Physics.** A lecture and problem course surveying subatomic physics; includes the nature and properties of nuclei and elementary particles, symmetries, interactions, nuclear models, tools and techniques of experimental subatomic physics, and applications to power generation, astrophysics, chemistry, medicine, and biology. Prerequisite: Physics 383 or 386, or consent of instructor. 4 hours or 1 unit.
383. **Atomic Physics and Quantum Theory.** Introduction to the basic concepts of quantum theory which underlie modern theories of the properties of materials; topics covered include elements of atomic and nuclear theory; kinetic theory and statistical mechanics; quantum theory and simple applications; atomic spectra and atomic structure; molecular structure and chemical binding. Lectures and problems. Prerequisite: General physics; general chemistry; Mathematics 345 or equivalent. 3 hours, or 3/4 or 1 unit. S phenomena integrated with an introduction to quantum theory; discussion of topics includes evidence for the atomic nature of matter and the properties of the Schrodinger equation, single particle solutions in one dimension, the hydrogen atom, perturbation theory, external fields, and atomic spectroscopy of outer electrons. Prerequisite: General physics; Mathematics 343 or 345, or consent of instructor. 4 hours or 1 unit.
387. **Atomic Physics and Quantum Mechanics, II.** Continuation of Physics 386. Topics treated include identical particles, spectral hyperfine structure, magnetic properties of matter, atomic spectroscopy of inner electrons, high-energy photon effects, molecular binding and spectra, emission and absorption of light, and symmetry principles. Prerequisite: Physics 386. 4 hours or 1 unit.
389. **Introduction to Solid State Physics.** Bonding and structure of crystals; energy bands in insulators, semiconductors, and metals; electrical conductivity; optical properties; lattice vibrations; elasticity; point defects; dislocations. Prerequisite: Junior standing in science or engineering, or equivalent. 4 hours or 1 unit.
397. **Individual Study.** Individual study at an advanced level in a subject not covered by course offerings. Prerequisite: Upperclassman; consent of adviser and staff member who supervises the work. 1 to 4 hours, or 1/4 to 1 unit. May be repeated once.
398. **Seminar on Special Topics in Modern Physics.** Lecture course on topics of current interest in physics. For advanced undergraduates or graduates. Subjects and prerequisites to be announced in the Timetable. 1 to 4 hours, or 1/4 to 1 unit.
402. **Theoretical Astrophysics.** Same as Astronomy 402. Application of physical principles to selected topics in astrophysics, including stellar structure and evolution, neutron stars and pulsars, cosmic electrodynamics, and cosmological problems; emphasis on the physics involved rather than on detailed factual description. Prerequisite: Physics 333 and 386, or consent of instructor. 1 unit.
404. **Stellar Structure and Evolution.** Same as Astronomy 404. See Astronomy 404.
405. **Theory of the Interstellar Medium.** Same as Astronomy 405. Interstellar gas: balance of microscopic processes, large scale structure, interaction with stars, dynamics, heating, ionization, and cooling; continuous and discrete radiation processes, excitation mechanisms, propagation of radiation, molecule formation, dust grains, star formation, magnetic fields, and cosmic rays. Prerequisite: Consent of instructor. 1 unit.
406. **Nuclear Astrophysics.** Same as Astronomy 406. See Astronomy 406.

- 411. Special Functions and Boundary Value Problems in Physics.** Use of special functions in solving homogeneous partial differential equations of physics; emphasis on applications to topics such as electrostatics, wave guides and resonant cavities, vibrations of membranes, heat flow, and potential flow in fluids. Prerequisite: Mathematics 343 and 345, or equivalent. This course may be taken concurrently with Physics 413 or 414. 1/2 unit.
- 412. Additional Techniques of Mathematical Physics.** Solution of inhomogeneous differential equations with particular emphasis on problems in electromagnetism; additional topics such as perturbation theory, variational methods, and integral equations; emphasis on application of the techniques to nonquantum physics problems. Prerequisite: Physics 411 or equivalent. This course may be taken concurrently with Physics 413 or Physics 414. 1/2 unit.
- 413. Uses of Complex Variables in Physics.** A review of complex variable theory, with emphasis on calculations useful to physicists; integration, conformal mapping, Laplace and Fourier transforms, and additional topics of use in theoretical physics. Prerequisite: Undergraduate mathematics at the level of Mathematics 343 and 345; some previous exposure to complex variables helpful, but not required. 1/2 unit.
- 414. Basics of Advanced Mechanics.** Fundamentals of classical Lagrangian and Hamiltonian mechanics, with emphasis on the relation between dynamical symmetries and constants of the motion; use of conservation laws to derive basic equations of fluid dynamics; discussion of some applications. Prerequisite: Mechanics at the level of Physics 332 or consent of instructor. 1/2 unit.
- 424. General Relativity and Cosmology.** Same as Astronomy 424 and Mathematics 460. Foundations of general relativity and applications to problems of astrophysics; includes gravitation as geometry, mathematical tools, Einstein's equations, relativistic stellar structure, black holes and gravitational collapse, cosmology, gravitational radiation, and experimental tests. Prerequisite: Physics 332, 411, 412, and 442, or equivalent; or consent of instructor. 1 unit.
- 430. Surface Physics.** Same as Metallurgical Engineering 430. See Metallurgical Engineering 430.
- 435. Theory of Semiconductors and Semiconductor Devices.** Same as Electrical Engineering 435. See Electrical Engineering 435.
- 442. Classical Electromagnetic Radiation.** A review of Maxwell's equations followed by a relativistic formulation of the electromagnetic field and the motion of charged particles; plane and guided waves; retarded potentials; radiation from simple antennas; radiation from accelerated charged particles; synchrotron radiation, bremsstrahlung, scattering, and further topics. Prerequisite: Physics 411 and 412, or equivalent; electromagnetism at the level of Physics 333; special relativity at the level of Physics 210. 1 unit.
- 455. Reactor Theory, I.** Same as Nuclear Engineering 455. See Nuclear Engineering 455.
- 456. Reactor Theory, II.** Same as Nuclear Engineering 456. See Nuclear Engineering 456.
- 462. Statistical Mechanics and Kinetic Theory.** Single-particle distribution functions; classical and quantum mechanical systems, Boltzmann equation, virial theorem, and equations of state for gases; formal theory: ensembles, identical particles, thermodynamics of simple systems, and distribution functions; nonequilibrium problems; conservation laws and hydrodynamic equations, sound waves, and transport coefficients; plasmas, normal Fermi fluid, superfluids, and systems with internal degrees of freedom. Prerequisite: Physics 361 and elementary quantum mechanics, or consent of instructor. 1 unit.
- 463. Liquid Helium and Superconductivity.** Emphasizes fundamental physical phenomena rather than detailed microscopic theory; normal Fermi liquids and normal liquid ^3He : equilibrium properties, kinetic equation, collective modes, and finite temperature effects; superfluid ^4He : equilibrium properties, two fluid model, Bogoliubov's microscopic model, condensates, and vortex lines; superconductivity: electrodynamic properties, Landau-Ginzburg theory, BCS theory, tunneling,

- Josephson effect, and superfluid ^3He . Prerequisite: Physics 462 and 481, or consent of instructor. 1 unit.
465. **Plasma Physics.** Survey of plasma phenomena in nature and in the laboratory; physical description of plasma phenomena by the independent particle model, one- and two-fluid models, magnetohydrodynamic equations, and kinetic equations; applications to quantum plasmas; nonlinear effects and turbulence in plasmas; astrophysical and thermonuclear plasmas. Prerequisite: Physics 333 or equivalent, or consent of instructor. 1 unit.
466. **Advanced Plasma Physics.** Microscopic theory of plasma collective behavior; plasma kinetic equations, fluctuations and correlations, linear waves and instabilities in magnetized plasmas, nonlinear plasma behavior, and plasma turbulence. Prerequisite: Physics 465, or consent of instructor. 1 unit.
470. **Introduction to Nuclear and Particle Physics.** Nuclear systematics, nucleon-nucleon interaction, shell model, and single particle and collective excitations; hadron spectroscopy, hadronic quantum numbers, quark-parton model, and hadron dynamics; weak interactions. Prerequisite: Physics 480 and concurrent registration in Physics 481. 1 unit.
471. **Nuclear Physics, I.** Systematics of stable nuclei and the nuclear potential; properties of odd- A nuclei; spherical single- particle shell model; residual interactions; collective states and deformed nuclei; summary of theory and experiment for low- lying states; momentum distribution of nucleons; fission. Prerequisite: Physics 470. 1 unit.
472. **Nuclear Reactions.** Theory and observation of the interaction of electrons, photons, protons, neutrons, and heavier projectiles with nuclei; elastic and inelastic scattering and particle transfer; resonance reactions and fission; and exotic atoms, meson-nucleus interactions, and scattering. Prerequisite: Physics 382 and 481, or equivalent, or consent of instructor. 1 unit.
475. **Particle Physics, I.** Particles: properties and systematics; S-matrix theory; application of symmetry and invariance principles to decays, production processes, and polarization; collision processes; mesonic and baryonic resonances; symmetry schemes; particle scattering at very high energies; theory of pion-nucleon scattering, dispersion relations, and Mandelstam representation. Prerequisite: Physics 470; credit or concurrent registration in Physics 483 recommended. 1 unit.
476. **Particle Physics, II.** Electromagnetic interactions of particles, form factor, and predictions of unitary symmetry; beta and muon decay and capture, conserved and partially conserved currents, neutrino interactions, and weak interaction form factors; leptonic and nonleptonic decays of strange particles; neutral K-meson decays; current topics. Prerequisite: Physics 470; credit or concurrent registration in Physics 483 recommended. 1 unit.
480. **Quantum Mechanics, I.** A second course in quantum mechanics for students with a good background in wave mechanics and atomic and molecular structure. Operators, state vectors, and the formal structure of quantum theory; operator treatments of simple systems; angular momentum and vector addition coefficients; stationary state perturbation theory; introduction to scattering theory for particles without spin, partial wave analysis, and Born approximation; examples taken from atomic, nuclear, and elementary particle physics. Prerequisite: Senior- level atomic physics and quantum mechanics, or consent of instructor. 1 unit.
481. **Quantum Mechanics, II.** Spin and identical particles, simple many-particle systems and elements of second-quantization theory; time-dependent processes, radiative transitions, and quantization of the electromagnetic field; scattering of particles with spin; polarization; introduction to the Klein- Gordon and Dirac equations, and properties of simple relativistic systems. Prerequisite: Physics 480 or consent of instructor. 1 unit.
483. **General Field Theory.** Covers standard techniques of field theory as used by experimenters and theorists; relativistic quantum mechanics of a single particle; Lagrangian field theories, perturbation theory, and calculation of lowest-order processes; introduction to Feynman diagrams and higher order processes; examples

- taken from quantum electrodynamics, solid- state and elementary particle physics, and many-body theory. Prerequisite: Physics 481 or consent of instructor. 1 unit.
485. **Advanced Field Theory.** Quantization and Feynman path integral; gauge theories and renormalization; renormalization group with applications to particle physics and critical phenomena; approximation methods and recent developments. Prerequisite: Physics 483 or consent of instructor. 1 unit.
486. **The Constitution and Behavior of the Upper Atmosphere.** Same as Electrical Engineering 486. See Electrical Engineering 486.
489. **Solid State Physics, I.** Crystalline perfection, free electron gas, screening, plasma oscillations, and dielectric response; Bloch electrons, Brillouin zones, and band structure; semiconductors, intrinsic and extrinsic, with applications; phonons, elasticity, and anharmonicity; ferromagnetism and second-order phase transitions; superconductivity. Prerequisite: Physics 361 or consent of instructor; and Physics 480. 1 unit.
490. **Solid State Physics, II.** Hartree-Fock theory and electron- electron interactions; electron-phonon interactions; electron dynamics and transport; BCS theory of superconductivity; elastic properties; thermal properties due to anharmonicity; defects in solids. Prerequisite: Physics 481 and 489. 1 unit.
496. **Seminar on Current Research.** Discussions and lectures on current research, including presentations by graduate students of their own work. 0 units.
497. **Individual Study.** Individual study in a subject not covered in course offerings may be arranged for credit by registration under this number. 1/2 to 4 units.
498. **Seminar on Special Topics in Modern Physics.** Lecture course in topics of current interest. Several subjects are announced in each Timetable. Among them are semiconductor physics, magnetic resonance, surface physics, lattice dynamics, band theory of solids, crystal imperfections, nuclear structure, field theory, elementary particle physics, advanced statistical mechanics, plasma theory, astrophysics, atmospheric physics, group theory and applications. Prerequisite: Determined for each offering. 1/4 to 1 unit.
499. **Thesis Research.** 0 to 4 units

PHYSIOLOGY AND BIOPHYSICS

Head of Department: Professor J. E. Heath

Department Office: 524 Burrill Hall, 407 S. Goodwin, Urbana

Biophysics

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
290. **Reading and Individual Topics.** Reading or laboratory work chosen in consultation with a departmental faculty sponsor. Prerequisite: Consent of instructor. 2 to 4 hours. May be repeated to a maximum of 10 hours.
301. **Introduction to Biophysics.** Review of the field of biophysics designed to introduce the student to types of biological problems currently under investigation. Prerequisite: Eight hours of physics. 3 hours or 3/4 unit.
302. **Fundamentals of Nervous Activity.** The quantitative basis of the generation and transmission of electrical signals within and between nerve cells; develops and discusses, with examples, the physical relationships describing resting potential, core conduction, excitation, and synaptic transmission. Meets during the first half of the spring semester. Prerequisite: One year of calculus and one year of college physics. 2 hours or 1/2 unit.
312. **Introduction to Radiobiology.** Nature and mechanisms of the biological consequences of low dose and chronic irradiation. Intended primarily for students in

- engineering and physical sciences. Prerequisite: Mathematics 241, or 240 and 245; 8 hours of physics; consent of instructor. 2 hours or 1/2 unit.
332. **Photosynthesis.** Same as Botany 332. A comprehensive description of photosynthesis; topics include: the photosynthetic membranes, light absorption, electron and proton transfer, photophosphorylation, water oxidation, RUBP carboxylase/oxygenase, photorespiration, whole plant photosynthesis, translocation and herbicide action. Prerequisite: Botany 330, Biochemistry 350, Biophysics 301, or equivalent; or consent of instructor. 3 hours or 3/4 unit.
336. **Plant Biophysics.** Same as Botany 336. See Botany 336.
350. **Biomolecular Physics.** Same as Physics 350. See Physics 350.
354. **Biological Energy Conversion.** Introduces and explores the major mechanisms of energy conversion in biology, with particular emphasis on respiratory and photosynthetic bioenergetics, and the physico-chemical tools required to describe these processes. Prerequisite: Biochemistry 350, and Chemistry 340 or equivalent; or consent of instructor. 3 hours or 3/4 unit.
404. **Physiological Measurements.** Same as Physiology 404. See Physiology 404.
406. **Principles of Biophysical Measurements.** Lecture course designed to acquaint the student with physical methods useful in the solution of biological problems; topics covered include bioelectric measurements, including basic electronics; optical methods, including microscopy, spectrophotometry, and measurement of action spectra; use of high-energy radiations; tracer techniques; and acoustical techniques. Prerequisite: Consent of instructor. 1/2 unit.
410. **Special Topics in Biophysics.** Advanced course on some topic of interest in biophysics, such as electrobiology, radiation biology, photobiology, bioacoustics, or the physics of muscular contraction. Prerequisite: Consent of instructor. 1/4 to 1 unit.
411. **Seminar.** Survey of literature in one area of biophysics, with special emphasis on student reports. Prerequisite: Enrollment in the biophysics program or consent of instructor. 1/4 or 1/2 unit.
414. **Sensory Biophysics.** Advanced treatment of sensory systems which are approachable in detailed quantitative terms, with emphasis on the visual system; lectures scheduled during the first quarter of the spring semester. Normally carries 1/4 unit credit; however, students may develop a particular topic introduced in the lectures into a term paper for an extra 1/4 unit credit. Prerequisite: Biophysics 301, Physiology 301 or 403, or consent of instructor. 1/4 or 1/2 unit. Students must see the instructor before enrolling for 1/2 unit.
415. **Radiation Biophysics.** Consideration in quantitative terms of the mechanisms of the responses of molecules and cells to ionizing radiation; meets during the second quarter of the spring semester. Prerequisite: Graduate standing in biophysics, one year of physics beyond introductory physics and Biophysics 301 or 312, or consent of instructor. 1/4 unit.
424. **Ultrasonic Biophysics.** Same as Bioengineering 424. Ultrasonic propagation in, and interaction with, biological media at macromolecular, cellular, and organismic levels of structure; meets during the first quarter of the spring semester in alternate years. Prerequisite: Graduate standing in biophysics or consent of instructor. 1/4 unit.
426. **Kinetic Models in Biophysics.** Techniques of constructing kinetic models to correlate data from biological systems; includes drawing implications of physical mechanisms from model behavior; and considers intensive treatment of excitable cell membrane as an example of a modelled system. Meets during the second half of the spring semester in alternate years. Prerequisite: Cellular physiology and calculus. 1/2 unit.
428. **Cell Membranes.** Isolation and biochemical analysis; experimental membrane models Gouy-Chapman-Stern layers; equations of transport (diffusional, mediated, and active); phospholipid bilayers and protein subunits; and cell membrane synthesis (in vivo and in vitro). Meets during the second half of the spring semester in alternate

- years. Prerequisite: Biophysics 301 or Physiology 402; Biochemistry 350 or equivalent. 1/2 unit.
438. **Bioenergetics of Photosynthesis.** Same as Botany 438. Biophysical and biochemical mechanisms of green plant and bacterial photosynthesis; includes the role of membranes; and emphasizes energetic aspects of photosynthesis. Meets during the last half of the fall semester. Prerequisite: One year each of college physics, chemistry, and biology; Biochemistry 350 or Biophysics 301; or consent of instructor. 1/2 unit.
440. **Research Topics in Biophysical Chemistry.** Same as Biochemistry and Chemistry 440. See Chemistry 440.
463. **Radioisotopes in Biological Research: Principles and Practice.** Same as Veterinary Biosciences and Animal Science 463. See Veterinary Biosciences 463.
475. **Biophysics of Muscle.** Description and analysis of the fundamental physical processes underlying motility and contraction in living systems; surveys recent advances and assesses current status of relevant problems; meets during the second quarter of the fall semester in alternate years. Prerequisite: Chemistry 340 or 342, and Biochemistry 350. 1/4 unit.
490. **Individual Topics.** For graduate students wishing to study individual problems or topics not assigned in other courses. Prerequisite: Consent of instructor. 1/2 to 2 units.
499. **Thesis Research.** Research may be conducted in one of the areas listed below, subject to approval of the staff member concerned and the department in which the research is to be done: (a) bioacoustics; (b) biophysics of excitable membranes; (c) physical properties of lipids and membranes; (d) lipid biophysics, model membranes, and pollution effects; (e) photobiology and photosynthesis; (f) biophysics of muscular contraction; (g) radiobiology; (h) information theory and cybernetics; (i) ion transport and permeability; (j) mechanical properties of tissues; (k) biophysical chemistry; (l) sensory biophysics. 0 to 4 units

Physiology

101. **Introduction to Human Physiology: Physical and Chemical Bases of Cell Function, Principles of Physiological Control Systems, Coordinated Body Functions.** Emphasizes those aspects especially illustrative of general principles of biology; designed to be one-half of a student's life sciences general education requirement; especially suitable for coupling with an anthropology or psychology course. Prerequisite: High school chemistry strongly recommended. 3 hours. Credit will not be given for Physiology 101 and either Physiology 102 or 103.
102. **Introduction to Human Physiology: Principles of Physiological Control Systems, Coordinated Body Functions, Physiological Bases of Behavior.** Emphasizes those aspects which make physiology unique among the life sciences; designed to be one-half of a student's life sciences general education requirement; especially suited for coupling with another course in biology. Prerequisite: A college course in biology or equivalent (for example, 3 hours credit or credit waiver via CLEP examination). 3 hours. Credit will not be given for Physiology 102 and either Physiology 101 or 103.
103. **Introduction to Human Physiology: The Physical and Chemical Bases of Cellular Function, Principles of Physiological Control Systems, Coordinated Body Functions, Physiological Bases of Behavior.** Prerequisite: High school chemistry strongly recommended. 4 hours. Credit will not be given for Physiology 103 and either Physiology 101 or 102.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
234. **Human Anatomy and Physiology.** Study of the essentials of anatomy and physiology with special reference to muscular and nervous systems. Prerequisite: Physiology 103 or consent of instructor. 5 hours.
290. **Reading and Individual Topics Course.** Readings or laboratory work in fields chosen in consultation with a departmental faculty sponsor. Must be taken in partial

fulfillment of departmental honors requirements. Prerequisite: A course in physiology; consent of instructor. 2 to 4 hours. May be repeated for a maximum of 10 hours.

295. **Special Topics in General Physiology.** Selected topics in general physiology. Prerequisite: Credit or concurrent registration in Physiology 301; consent of instructor. 2 hours.
296. **Special Topics in Animal Physiology.** Selected topics in animal physiology. Prerequisite: Credit or concurrent registration in Physiology 302; consent of instructor. 2 hours.
301. **General Physiology.** A consideration from the standpoint of experimental biology of functions that are common to most eukaryotic cells. Prerequisite: Biology 111 or 251, or equivalent; one year each of college-level mathematics and physics; chemistry through organic with laboratory. 3 hours or 3/4 unit.
302. **Animal Physiology.** Organ physiology of animals; emphasis on homeostasis and physiological interactions of animals with their environment. Prerequisite: Biology 111 or 251, or equivalent; one year each of college-level mathematics and physics; chemistry through organic with laboratory. 3 hours or 3/4 unit.
303. **General Physiology Laboratory.** An introduction to experimentation with cellular functions common to most eukaryotic cells; emphasis on biochemical, radioactive tracer, electrical, and mechanical recording techniques. Prerequisite: Credit or concurrent registration in Physiology 301. 2 hours or 1/4 unit.
304. **Experimental Physiology Laboratory.** Introduction to problems and techniques for studying the physiology of organ systems. Prerequisite: Credit or concurrent registration in Physiology 302. 2 hours or 1/4 unit.
305. **Principles of Ergonomics.** Same as Industrial Engineering and Physical Education 305. See Industrial Engineering 305.
312. **Endocrinology.** Physiology and biochemistry of the endocrine system with special reference to vertebrates. Prerequisite: Physiology 301 or a course in biochemistry. 3 hours or 3/4 unit.
316. **Integrative Neurophysiology.** Advanced studies of mechanisms of neuron network function in behavior; topics include: neural coding, motor pattern generation, mechanisms of plasticity in neural function, epilepsy, and neural models of motivation, habituation and arousal, choice, and learning. Prerequisite: Biophysics 302, Physiology 302, or Biology 303; or consent of instructor. 3 hours or 3/4 unit.
331. **General Radiobiology.** Response of multicellular organisms, cells, and macromolecules to ionizing radiations. Lectures, student reports, and discussions. Prerequisite: One year each of mathematics, physics, chemistry, and biology. 4 hours or 1 unit.
401. **Physiology of Systems and Organs.** Analysis of organization and function of vertebrate systems, which combines the viewpoints of traditional cellular, comparative, mammalian, and human physiology; nervous, circulatory, digestive, and excretory systems; and gross metabolism. Prerequisite: One year of college-level physics; chemistry through organic; an upper-division course in physiology; physical chemistry and biochemistry recommended; knowledge of calculus presumed. 1 unit.
402. **Comparative and Adaptational Physiology.** The first half of the course deals with comparative mechanisms of adaptation to the environment, including homeostatic theory, osmotic and ionic regulation, respiration and metabolism, nutrition and digestion, and temperature relations; the second half concerns comparative behavioral physiology, including sense organs, mechanisms of motility (especially muscles), and central nervous integration. Prerequisite: One year of college-level physics; chemistry through organic; an upper-division course in physiology; physical chemistry and biochemistry recommended; knowledge of calculus presumed. 1 unit.
403. **Cellular and Molecular Physiology.** Physicochemical analysis of cellular function and structure; consideration of the implications of the properties of cells for the physiology of multicellular animals. Students may enroll for the lecture series on physiology of cytoplasm and the nucleus, cell growth and division and cellular regulatory mechanisms, and/or for the lecture series on physiology of cell

- membranes, bioelectrics, and motility. Prerequisite: One year of college-level physics; chemistry including physical and biochemistry; an upper-division course in physiology; knowledge of calculus presumed. 1/2 or 1 unit.
404. **Physiological Measurements.** Same as Biophysics 404. Laboratories concerned with introducing at a graduate level current research techniques in the physiological and biophysical sciences; problem-oriented laboratories; students select up to four special topics representing different areas of physiology and biophysics, such as mammalian and human, molecular, cellular and radiation biology, comparative physiology, and biophysical measurements. Emphasis placed on ability to work independently, and students give written reports of their experiments. Prerequisite: Consent of instructor. 1/4 to 1 unit. May be repeated to a maximum of 1 1/2 units.
405. **Neurochemistry.** Same as Psychology 405. See Psychology 405.
406. **Physiology of Reproduction.** Same as Animal Science 406. See Animal Science 406.
407. **Laboratory Methods in Physiology of Reproduction.** Same as Animal Science and Veterinary Biosciences 407. See Animal Science 407.
409. **Faculty Research Topics.** Advanced seminars by the faculty on their current research activities. Prerequisite: Consent of instructor. 0 or 1/4 unit. May be repeated to a maximum of 1/2 unit.
410. **Special Topics in Physiology.** Advanced seminars on current topics of interest in physiology. Prerequisite: Consent of instructor. 0 or 1/4 unit. May be repeated to a maximum of 2 units.
412. **Advanced Endocrinology.** Same as Animal Science, Dairy Science, and Veterinary Biosciences 412. Seminar, lectures, student reports, and discussions of recent advances in endocrinology. Prerequisite: Physiology 312; consent of instructor. 1/2 unit. May be repeated to a maximum of 2 units.
413. **Experimental Mammalian Physiology.** Same as Veterinary Biosciences 413. See Veterinary Biosciences 413.
416. **Neurophysiology Laboratory.** Neurophysiological techniques and experiments illustrating nerve membrane properties, synaptic action and plasticity, organization and pattern generation in motor systems, and sensory coding in visual and acoustic systems. Prerequisite: Credit or concurrent registration in Physiology 316 or consent of instructor. 1/2 unit.
418. **Neuroendocrinology.** Advanced studies on central nervous system/hormone interaction in vertebrates. Neuroanatomy and maturation of neuroendocrine control systems; production, biochemistry, and physiological effects of neurohormones; and neuroendocrine techniques. Prerequisite: Physiology 312 and one of the following: Physiology 316, 401, or 402; consent of instructor. 3/4 unit.
420. **Mammalian Physiology Seminar.** Current trends in mammalian physiology. Prerequisite: Physiology 401 and 402, or equivalent; consent of instructor. 1/2 unit.
441. **Advanced Comparative Physiology.** Seminar, lectures, student reports, and discussions. Topics rotate in three-year cycle: adaptational physiology, comparative neurophysiology, and comparative physiology of motile mechanisms. Prerequisite: Consent of instructor. 1/2 unit.
451. **Advanced Cellular Physiology.** Seminar, lectures, student reports, and discussions. Prerequisite: Consent of instructor. 1/2 unit.
470. **Human Pathologic Physiology.** Disturbances of function in tissues and organs and their relationship to the pathogenesis of human disease. Prerequisite: Two semesters of advanced physiology; one semester of biochemistry; consent of instructor. 3/4 unit.
472. **Human Physiology Seminar.** Topics of current emphasis in human physiology. Prerequisite: Two semesters of advanced physiology; one semester of biochemistry; consent of instructor. 1/2 unit.
473. **Ergonomics Seminar.** Same as Industrial Engineering 473 and Physical Education 473. See Industrial Engineering 473.

490. **Individual Topics.** For graduate students wishing to study individual problems or topics not assigned in other courses. Prerequisite: Approval of department. 1/2 to 2 units.
499. **Thesis Research.** Research may be conducted in the following areas, with the consent of the instructor: (a) cellular and molecular physiology; (b) comparative physiology; (c) mammalian physiology; (d) human anatomy and human physiology; (e) endocrinology; (f) neurophysiology; (g) radiobiology; and (h) environmental and stress physiology. 0 to 4 units

PLANT PATHOLOGY

Head of Department: Professor R. E. Ford

Department Office: W-519 Turner Hall, 1102 S. Goodwin, Urbana

204. **Introductory Plant Pathology.** Concepts relating to causal agents of representative plant diseases, symptoms, and diagnosis, modes of infection and spread, effects of environment on disease development, and methods of control; designed for students in other departments which require or recommend an introductory plant pathology course; lecture and laboratory- discussion. Prerequisite: Botany 100 or equivalent. 3 hours.
300. **Special Problems.** For students desiring to study specific problems not assigned in other courses. Prerequisite: For undergraduates only, a minimum grade-point average of 3.5; not open to students on probation; senior standing; consent of instructor and head of department. Specific approval of the associate dean in advance of registration is required for a second and/or third special problem course. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department subject to approval of the instructor. 1 to 4 hours, or 1/4 to 1 unit.
301. **Principles of Plant Pathology.** Basic principles concerning the nature, cause, development and control of plant diseases; intensive study of important diseases and their causal agents; designed for graduate students in plant pathology; lecture and discussion. Prerequisite: An introductory course in biology and consent of instructor. 4 hours or 1 unit.
302. **Research Methods in Plant Pathology.** Techniques for the isolation, identification, culture of, and inoculation with plant pathogens; methods for the histological study of diseased plants; and recording of data. Prerequisite: Plant Pathology 204 or 301, or equivalent; senior standing. 3 hours or 3/4 unit.
303. **Plant Nematology.** Experimental techniques; symptomatology; nematode anatomy, taxonomy, biology, ecology, and host-parasite relationships; intensive study of selected groups, including root-knot, cyst, lesion, stem, and foliar nematodes; interaction with fungi, bacteria, and viruses in plant disease development; and principles of control. Lecture and laboratory. Prerequisite: Plant Pathology 204 or 301 and an introductory course in zoology or biology. 4 hours or 1 unit. Offered in alternate years.
304. **Forest Pathology.** Same as Forestry 304. Principles of forest and shade-tree diseases; symptoms, causal agents, and control of major tree diseases and wood decays; and the role of man in creating and solving disease problems. Prerequisite: Botany 100 or equivalent. 3 hours or 3/4 unit.
305. **Principles of Plant Disease Control.** The basic concepts of nonchemical and chemical methods used for the control of plant diseases; field trip required. Prerequisite: Plant Pathology 204 or 301; Chemistry 102 or 103 with laboratory; or equivalent. 3 hours or 3/4 unit.
308. **Plant Disease Diagnosis.** Field and laboratory techniques in plant disease diagnosis and appraisal; identification of diseases of small grains, turf, corn, soybeans, forage crops, vegetables, fruit, forest and shade trees, and ornamentals,

- both on field trips and in laboratory exercises. Prerequisite: Plant Pathology 204 or 301 or consent of instructor. 2 hours or 1/2 unit. Offered during summer session only.
310. **Diseases of Ornamental Plants.** Same as Horticulture 310. Causal agents, disease diagnosis, patterns of development, factors affecting incidence and severity, and control of diseases and related problems of nursery, greenhouse, and landscape ornamentals; lecture and laboratory. Offered in alternate years. Prerequisite: Plant Pathology 204, 301, or 304; Horticulture 201 and 202; or equivalent. 3 hours or 3/4 unit.
377. **Diseases of Field Crops.** Same as Agronomy 377. Study of the symptoms of the major field crop diseases, life history of causal organisms, and methods of control. Prerequisite: Plant Pathology 204 or 301, or equivalent. 3 hours or 3/4 unit.
402. **Phytopathology.** Study of pathogenic bacteria and their role in plant disease; history, morphology, reproduction, taxonomy, and identification; emphasis on arrival, invasion, symptoms, and control; and assigned reading, lectures, and laboratory. Prerequisite: Plant Pathology 301 and Microbiology 309, or consent of instructor. 3/4 unit. Offered in alternate years.
403. **Physiology of Fungi.** Same as Botany 403. The germination, growth, metabolism, and sporulation of fungi; physiology of the fungi as related to parasitism, antibiotic production, vitamin assay, and industrially important products; and discussion of the nature of fungicidal activity. Prerequisite: Plant Pathology 204 or 301, or equivalent; organic chemistry or biochemistry; mycology and microbiology. 1 unit. Offered in alternate years.
404. **Plant Virology.** Comprehensive study of plant viruses and virus diseases; includes symptomatology, structure, transmission, characterization, purification, classification, assay methods, replication, epidemiology, and control. Lecture- discussion and laboratory; students may register for lecture- discussion only. Prerequisite: Plant Pathology 301 and Biochemistry 350, or consent of instructor. 3/4 or 1 unit. Offered in alternate years.
406. **Genetics of Plant-Pathogen Interactions.** The genetics and expression of resistance in plants to fungi, bacteria, viruses, nematodes, and other pathogens; variation and genetic systems in pathogens with particular emphasis on pathogenicity; complementary genetic systems; and theory and practice of breeding disease-resistant plants. Lectures, discussions, assigned reading, and term paper. Prerequisite: Plant Pathology 204 or 301, Agronomy 323 or Horticulture 323, or consent of instructor. 1 unit. Offered in alternate years.
407. **Physiology of Plant-Parasite Interactions.** Current concepts on physiological and biochemical bases of plant diseases; mechanisms of infection and disease development; theories of resistance and susceptibility; and interrelationships of physiological and biochemical activities that occur during the interaction of plants and their parasites. Prerequisite: One course each in plant pathology, biochemistry, and plant physiology, or consent of instructor. 1/2 unit. Offered in alternate years.
408. **Epidemiology of Plant Diseases.** Principles and concepts in epidemiology; measurements, analysis, environmental factors, dissemination of pathogens, control measures, disease appraisal, estimation of yield loss, and forecasting and simulation of epidemics. Offered in alternate years. Prerequisite: Plant Pathology 204, 301, or 304; and a course in statistics; or consent of instructor. 3/4 unit.
417. **Discussions in Plant Pathology.** Discussion of current research, literature, and other topics pertaining to plant pathology and related fields. 0 or 1/4 unit.
431. **Plant Cell Metabolism.** Same as Agronomy, Biology, Forestry, and Horticulture 431. See Biology 431.
432. **Plant Cell Energetics.** Same as Agronomy, Biology, Forestry, and Horticulture 432. See Biology 432.
433. **Environmental Regulation of Plant Growth.** Same as Agronomy, Biology, Forestry, and Horticulture 433. See Biology 433.
434. **Regulation of Plant Development and Reproduction.** Same as Agronomy, Biology, Forestry, and Horticulture 434. See Biology 434.

- 499. Thesis Research.** Individual study and research required of all students working toward the Master of Science or Doctor of Philosophy in plant pathology. Prerequisite: Plant Pathology 302 or equivalent. Work can be taken in the following areas, subject to approval of the staff member concerned: (a) biochemistry of plant disease; (b) diseases of corn, genetics of resistance; (c) diseases of cereal grains; (d) diseases of forest and shade trees; (e) diseases of fruit crops, fungicides; (f) diseases of leguminous crops, root diseases; (g) diseases of turf and lawn grasses; (h) diseases of soybeans; (i) diseases of vegetable and canning crops; (j) nematode diseases; (k) physiology of fungi, antibiotics; and (l) plant virology. 0 to 4 units

POLISH

(See Slavic Languages and Literatures)

POLITICAL SCIENCE

Head of Department: Professor R. Merritt

Department Office: 361 Lincoln Hall, 702 S. Wright, Urbana

- 100. Introduction to Political Science.** Survey of major concepts and approaches employed in political science. 3 hours.
- 150. American Government: Organization and Powers.** Historical development and organization of national, state, and local governments; the federal system; national and state constitutions; civil and political rights; party system; and nature, structure, powers, and procedure of legislative, executive, and judicial departments in state and nation. 3 hours.
- 198. Freshman Seminar.** Current topics in political science in the context of the scope and method of political science. Participants are required to do independent library research and present a report on a topic of their choice which is related to the subject of the seminar. Prerequisite: Consent of instructor. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 222. Introduction to Modern Africa.** Same as African Studies, Anthropology, and Sociology 222. See African Studies 222.
- 235. Women in Politics.** An introduction to the political status and roles of women. Topics include women's political socialization, voting behavior, and political participation; feminist and anti-feminist politics; and contemporary legislative and public policy issues, such as educational equity, equal rights legislation, and health care delivery for women. 3 hours.
- 240. Introduction to Comparative Politics.** Basic concepts and principles of political analysis from a comparative perspective. Prerequisite: Political Science 100 or 150, or consent of instructor. 3 hours.
- 241. The Emerging Nations.** An introductory comparative consideration of the patterns of political development and of the policies and problems of the emerging nations of Asia, Africa, and Latin America; emphasis on the special characteristics of countries beginning their independent nationhood and the effects of these characteristics on the political systems of these lands and their role in the community of nations. Prerequisite: Three hours of political science or consent of instructor. 3 hours.
- 250. Introduction to Public Policy.** Surveys the policy process including adoption, implementation, and evaluation; each student prepares a research paper: topics include reviews of substantive policy issues such as crime, energy, environment, poverty, foreign policy, civil liberties, or economic regulation. Prerequisite: Political Science 100 or 150, or consent of instructor. 3 hours.

260. **Introduction to Political Theory.** The nature, structure, and purposes of political theory; uses major works on the problems of political order, obedience, justice, liberty, and representation to distinguish and clarify different theoretical approaches; designed to be an introduction to ideas, not a historical survey. Prerequisite: Political Science 100 or 150, or consent of instructor. 3 hours.
270. **Introduction to Political Research.** Principles of empirical research in political science; emphasizes definition of research problems, principles and practices of measurement, use of data as evidence, and data analysis; data-based analysis is conducted in the Social Science Quantitative Laboratory. Prerequisite: Political Science 100 or 150, or consent of instructor. 3 hours.
280. **Introduction to International Relations.** The structure and processes of international relations, trends in international politics, and the future of the international system in a setting of conflict and crisis. Prerequisite: Political Science 100 or 150, or consent of instructor. 3 hours.
281. **Introduction to International Security and Arms Control.** An introduction designed for all students to major issues of arms control, disarmament and international security. The military, socio-economic, and political effects of nuclear and conventional weapons, military strategy, the ethics of modern warfare, nuclear proliferation, and regional security issues will be studied. 3 hours.
290. **Individual Study.** Readings and reports in selected fields chosen in consultation with the instructor. Prerequisite: Written consent of instructor. 1 to 4 hours. May be repeated.
293. **Honors Senior Thesis.** Prerequisite: Written consent of instructor; open only to seniors whose field of concentration is political science and who have a general University average of at least 4.0. 2 to 5 hours. May be repeated.
295. **Special Topics in Contemporary Issues and Problems.** Study of a contemporary problem in public policy, domestic or international. See Timetable for current topics. Prerequisite: Sophomore standing, 3 hours of political science, or consent of instructor. 3 hours. May be repeated for credit.
296. **Special Topics in Political Science.** Selected reading and research in political science. Prerequisite: Junior or senior standing; 6 hours of political science; consent of instructor. 3 hours. No more than 6 hours of credit may be earned by registration in this course and in Political Science 297.
297. **Honors Seminar.** Research, reading, and discussion in selected topics and works in literature of political science. Prerequisite: Junior or senior standing; 6 hours of political science; 4.0 average or James Scholar designation; consent of instructor. 3 hours. No more than 6 hours of credit may be earned by registration in this course and in Political Science 296.
299. **Government Internship.** Selected Government Internship participants together with faculty sponsor develop a program of study and research related to internship assignment. Consult departmental undergraduate advisor. Prerequisite: Junior standing; 4.0 grade average for most internships; Political Science 150 and one 300-level political science American government course; acceptance by faculty sponsor. 0 to 6 hours. May be repeated to a maximum of 12 hours.
300. **Socio-Economic Management as Public Policy.** Same as Accountancy, Business Administration and Social Science 300. See Social Science 300.
305. **Municipal Government.** Growth of cities; their legal status; and municipal politics and organization in the United States. 3 hours, or 1/2 or 1 unit.
306. **Municipal Problems.** Municipal administration in the United States; administrative organization; personnel problems; financial problems; city planning and housing; police and fire administration; public health; and public utilities. Prerequisite: Senior standing, or junior standing with Political Science 305 or Economics 101, or 6 hours of political science. 3 hours, or 1/2 or 1 unit.
312. **State Government.** The states in the federal system; state constitutions and problems of revision; organization, powers, and functions of the legislative, administrative, and judicial branches of state government; state functions;

- reorganization problems in the states; state-local relations; and state finance, trends, and prospects. Prerequisite: Political Science 150. 3 hours, or 1/2 or 1 unit.
313. **Comparative State Politics.** Approaches state government from an empirical and behavioral orientation, using contemporary sources chosen to introduce current analytical techniques and methods for explicating state politics; analysis of interactions among branches of government along with the impact of policy, interest groups, and constituencies. Prerequisite: Political Science 312, 315, or 328, or consent of instructor. 3 hours, or 1/2 or 1 unit.
314. **The Presidency.** Determinants and growth of presidential influence; presidential decision making; the president's role in the formulation and implementation of public policy; the president and constituencies; and the president's roles as legislator, party leader, and chief executive. Prerequisite: Political Science 100 or 150. 3 hours, or 1/2 or 1 unit.
315. **Legislatures and Legislation.** The legislative function in government; structure and organization of American legislatures (national, state, and local); party organization in legislatures; legislative procedure; pressure groups and lobbying; relation of legislature to other branches of government; and problems of legislative reorganization. Prerequisite: Six hours of political science. 3 hours, or 1/2 or 1 unit.
317. **The American Federal System.** The nature, justification, and problems of federalism; coordination of governmental efforts by contract, subsidies, and grants; and comparison of federal systems. Prerequisite: Political Science 150. 3 hours, or 1/2 or 1 unit.
321. **Government and the Economic Order.** Interplay of political and economic phenomena at various domestic, foreign, and international levels and applicability of certain generalized models. Prerequisite: Any two courses in political science or a combination of political science and economics. 3 hours, or 1/2 or 1 unit.
326. **American Political Parties.** Organization and operation of the American party system; relations between national, state, and local organizations; state and national committees; the convention systems; the primary; and campaign methods and finance. Prerequisite: Political Science 150 or consent of instructor. 3 hours, or 1/2 or 1 unit.
327. **Black Political Participation in the American Political Process.** Same as Afro-American Studies 327. Exposes students to the variety of literature on black people in American politics; political participation is the major theme. Since black and white scholars address themselves to the study of political behavior of blacks, it is necessary to compare not only their views but also to discuss the underlined message, or meaning, of their work to understanding American politics in general. Prerequisite: Political Science 150, or 6 hours or social science, or consent of instructor. 3 hours, or 1/2 to 1 unit.
328. **An Introduction to the Study of Political Behavior.** An analysis of the interrelations of political attitudes and public formation; special attention to the substantive areas of voting behavior, political leadership, and the rise of political mass movements; and also a review of the literature on democratic and authoritarian personality types. Prerequisite: Political Science 150 or equivalent. 3 hours, or 1/2 or 1 unit.
329. **Electoral Behavior.** Study of the social and psychological motivations behind the individual voting decision, with special emphasis on the relationships between the voting decision and social stability. Prerequisite: Six hours of political science. 3 hours, or 1/2 or 1 unit.
330. **Comparative Political Sociology.** Same as Sociology 330. See Sociology 330.
331. **British Government.** Nature of the British Constitution; the Crown, Ministry, and Cabinet; Parliament and elections; the party system; law and the courts; local government; and the British Commonwealth. Prerequisite: Six hours of political science or consent of instructor. 3 hours, or 1/2 or 1 unit.
332. **African Independence and Underdevelopment: 1945 to the Present.** Same as History 385. See History 385.
333. **Southern Africa: Race and Power.** Same as African Studies 325 and History 325. See African Studies 325.

335. **Government and Politics of the Soviet Union.** Evolution, structure, and functioning of the Soviet system of government; the theories, structure, and functioning of the Communist party of the Soviet Union. Prerequisite: Six hours of political science or consent of instructor. 3 hours, or 1/2 or 1 unit.
336. **Governments and Politics in Western Continental Europe.** An analysis of the major governmental systems of continental Europe; the evolution, structure, and functioning of the political institutions of France, Germany, Italy, Spain, Switzerland, and the Scandinavian countries as illustrations of multiparty and dictatorial types of governments. Prerequisite: Six hours of political science or consent of instructor. 3 hours, or 1/2 or 1 unit.
337. **Government and Politics of China.** Same as Asian Studies 337. An introduction to the governments and politics of modern China. Prerequisite: Six hours of political science or consent of instructor. 3 hours, or 1/2 or 1 unit.
338. **Governments and Politics in the Middle East.** Same as Asian Studies 338. An analysis of the transformation of Middle Eastern society from Morocco to Iran, as case studies in political modernization; study of politics of the area with special reference to causes and character of modernization, role of leadership, ideologies and institutions, methods and theories for analyzing political systems undergoing fundamental transformation, and implications for U.S. policy. Prerequisite: Six hours of political science or consent of instructor. 3 hours, or 1/2 or 1 unit.
339. **Governments and Politics of Sub-Saharan Africa.** Analysis of major political systems in Africa south of the Sahara; emphasis on the development of states and the modification of social and political systems; and a general survey of the area supplemented by a focus on selected countries. Prerequisite: Six hours of political science or consent of instructor. 3 hours or 1/2 or 1 unit.
340. **The German Political System.** Structures and processes of postwar German politics, with primary emphasis on West Germany; special attention to foreign policy formulation and problems (particularly defense), the Berlin issue, reunification, and relations with Eastern Europe. Knowledge of German helpful but not necessary. Prerequisite: Six hours of political science or consent of instructor. 3 hours, or 1/2 or 1 unit.
342. **Government and Politics in Latin America.** A survey of the origin and development of Latin American political institutions; systems of government; public administrative systems; party government; and international policies of Latin American governments. Prerequisite: Six hours of political science or consent of instructor. 3 hours, or 1/2 or 1 unit.
343. **Political Systems and Structures of Latin American Countries.** The political process, generally of selected Latin American countries at different levels of political development; stress on the interaction between political infrastructure and more formal agencies of government; and may include cross-national comparison of the function of such factors as political culture, party system, bureaucracy, or the military establishment. Prerequisite: Political Science 342. 3 hours, or 1/2 or 1 unit.
346. **Comparative Communist Systems: Eastern Europe.** Analysis of the origins of modern communism and the development of its doctrines; applications of these doctrines in the practices of ruling Communist parties; emphasis on alternates between European and non-European Communist systems, depending on course instructor. Prerequisite: Political Science 240 or consent of instructor. 3 hours, or 1/2 or 1 unit.
347. **Governments and Politics of Southeast Asia.** Same as Asian Studies 347. Comparative analysis of the political development of the countries of Southeast Asia, the lands to the east of India and south of China; emphasis on the differing approaches to the governing of man and the formation of public policy to be found in these countries; and consideration of economic, social, historical, and geographical influences on political development. Prerequisite: Political Science 240 or consent of instructor. 3 hours, or 1/2 or 1 unit.

348. **Government and Politics of Japan.** Same as Asian Studies 348. Introduction to the government and politics of modern Japan. Prerequisite: Political Science 240 or consent of instructor. 3 hours, or 1/2 or 1 unit.
349. **Governments and Politics of South Asia.** Same as Asian Studies 349. A comparative analysis of the political development of India, Pakistan, Ceylon, and the lesser lands of South Asia; emphasis on the differing approaches to the governing of man and the formation of public policy to be found in these countries; and consideration of economic, social, historical, and geographical influences on political development. Prerequisite: Political Science 240 or consent of instructor. 3 hours, or 1/2 or 1 unit.
350. **Law and Society.** An introductory study from a social science perspective of the nature of law, law makers, and law appliers; the causes or inputs determining law; and the effects or outputs which law in general produces. Prerequisite: Junior standing. 3 hours, or 1/2 or 1 unit.
351. **American Constitutional System.** Judicial interpretation of constitution; separation of governmental powers; relation of state and national governments; control of interstate commerce; and jurisdiction of courts. Prerequisite: Political Science 150. 3 hours, or 1/2 or 1 unit.
352. **Comparative Constitutional Law.** A comparative analysis of the constitutional law cases from a variety of countries with particular emphasis on how the cases have resolved issues relating to civil liberties and the allocation of power among governmental bodies. Prerequisite: Political Science 150. 3 hours, or 1/2 or 1 unit.
353. **Law and Politics of Poverty.** Study of court cases and other materials dealing with the legal rights and obligations of the poor as tenants, consumers, welfare recipients, employees, arrested persons, family members, legal clients, and political participants; emphasis on the constitutional, political, and sociological aspects of the legal rights involved including the political process through which relevant judicial and legislative policy is made and applied. Prerequisite: Political Science 150. 3 hours, or 1/2 or 1 unit.
354. **The Judicial Process.** A systematic analysis of legal, evidentiary, environmental, and personal factors that influence judicial decision making, with particular emphasis on the application of the scientific method to the study of judicial behavior. Prerequisite: Political Science 150. 3 hours, or 1/2 or 1 unit.
355. **The Constitution and Civil Liberties.** Study of free speech, loyalty in a democratic state, citizenship, freedom of religion, rights of persons accused of crime, and government's responsibility to protect persons from racial and religious discrimination; and special attention to the role of law and judges. Prerequisite: Political Science 150. 3 hours, or 1/2 or 1 unit.
356. **Public Administration and the Judicial Process.** The scope of administrative powers and their relation to private rights; a comparison of the processes of decision in administrative agencies and in the courts; the interests served by each; the impact of judicial review of administrative decisions upon administrative procedure and policy; the constitutional and statutory bases of review; and the legal accountability of public officers versus political accountability. Prerequisite: Political Science 305, 351, or 361, or consent of instructor. 3 hours, or 1/2 or 1 unit.
358. **Politics of Crime and the Criminal Process.** Same as Sociology 358. Examination of crime as a political issue and as a social problem; includes political aspects of law enforcement, the nature of the judicial process in criminal cases, and criminal justice reform; and emphasizes the legal system at the local level. Prerequisite: Political Science 150 and junior standing. 3 hours, or 1/2 or 1 unit.
359. **Jurisprudence.** Nature and sources of law; law and the state; law and justice; and evolution, arrangement, and subject matter of law. Prerequisite: Political Science 150. 3 hours, or 1/2 or 1 unit.
361. **Introduction to Public Administration.** Development of administrative organization; administration and the executive, legislature, and judiciary; principles of organization, including line and staff relationships; the staff services of finance and

- personnel; and formal and informal control. Prerequisite: Political Science 150. 3 hours, or 1/2 or 1 unit.
362. **Administrative Organization and Policy Development.** Dynamics of policy formulation in public administrative agencies; current developments in organizational theory and their significance for public administration; origin of public administrative organizations; interpersonal behavior; large-scale organizations and centralization; external support and opposition; and policy formation and problems of compliance. Prerequisite: Six hours of political science or consent of instructor. 3 hours, or 1/2 or 1 unit.
363. **Comparative Administration.** Study of modern bureaucratic organization by means of the comparative method; special reference to the bureaucracies of various countries in different stages of industrialization; and the cultural bases of administrative behavior. Prerequisite: Junior standing. 3 hours, or 1/2 or 1 unit.
366. **Tools of Public Management.** A critical survey of the tools of analysis available to overhead functions of public management in key areas of decision; emphasis on personnel administration and manpower utilization; budgetary processes and fiscal controls; and several methods of administrative analysis: organizational studies, procedures engineering, information processing, and operations research. Prerequisite: Political Science 361 or consent of instructor. 3 hours, or 1/2 or 1 unit.
370. **Selected Topics on Women and Politics.** Variable topics relating to the political roles and status of women, emphasizing the areas of comparative politics, political theory, political behavior, and international politics. See Timetable for current topics. Prerequisite: Political Science 235 or consent of instructor. 3 hours or 1 unit. May be repeated once for credit.
371. **World International Organization.** General development and basic principles of world organization; principles, structure, methods, and actual operation of international governmental institutions; and special attention to the United Nations and related agencies and to their evolution from the League of Nations system. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or 1/2 or 1 unit.
377. **International Communications.** Same as Communications 377. An interdisciplinary approach to international communications; its structure and content; the role of international communications in conflict and conflict resolution; the semantics of international communication; the technical and economic aspects of international mass communications; and government-industry relations in communications. Prerequisite: Political Science 280 or 6 hours of social science, or consent of instructor. 3 hours, or 1/2 or 1 unit.
379. **Problems of Foreign Policy.** Analyzes principal problems in the study and practice of the foreign policies of major states and alternative solutions available today. Prerequisite: Political Science 150 and 280. 3 hours, or 1/2 or 1 unit.
380. **Comparative Foreign Policies.** An analysis of the formulation and substance of the foreign policies of select nations of the world. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or 1/2 or 1 unit.
381. **American Foreign Relations.** Participation in international affairs; presidential initiative; development and organization of the Department of State; diplomatic intercourse; consular service; treaty-making power; and development of foreign policy. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or 1/2 or 1 unit.
382. **Contemporary American Foreign Policies.** Study of the major foreign policy decisions currently confronting the United States government: analysis of background, principal issues, and alternative actions; formulation of policies. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or 1/2 or 1 unit.
383. **Soviet Foreign Policy.** Survey of Soviet foreign policy from 1917 to the present, with emphasis upon the forces shaping this policy; special attention to the interplay of ideology and national interest in policy formulation. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or 1/2 or 1 unit.
384. **International Relations.** Examination of contemporary international systems in terms of the types of actors and their goals, various structures of power, and the

- mechanisms of allocating resources and containing conflict. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or 1/2 or 1 unit.
385. **International Law.** Nature, source, and development of international law and certain basic rights and obligations of the subjects thereof. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or 1/2 or 1 unit.
387. **National Security Policy.** Examination of the organization and formulation of current American defense policy; the theory and practice of deterrence, with special reference to American and Soviet military strategy; and the problems of disarmament and arms control. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or 1/2 or 1 unit.
388. **The Military and Politics.** The role of the military in national and international policies, with special attention given to theories of war and peace, civil-military relations, the military and the political development of Western and non-Western states, and the nonmilitary uses of the military. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or 1/2 or 1 unit.
389. **Chinese Foreign Policy.** Same as Asian Studies 385. An analysis of the formulation, substance, and conduct of Chinese foreign policy, with emphasis on the period since 1949; special attention to the forces shaping Chinese policy. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or 1/2 or 1 unit.
390. **Methods of Political Analysis.** Presentation of the analytic processes in the development of concepts, hypothesis, and theories; discussion of the derivation, formulation, and specification of research problems to be related to basic methodologies and modes of analysis; and applications to political science. Prerequisite: Political Science 270, or consent of instructor. 3 hours, or 1/2 or 1 unit.
392. **Socialist Political Theory.** Origins, development, and recent modifications of socialist theory from the late eighteenth century to the present; examination of each contribution in terms of its goals, efficacy, and subsequent influence; and discussion including Rousseau, Hegel, the Utopians, Marx and Engels, Anarcho-syndicalists, Lenin, Luxemburg, Trotsky, Mao, Guevara, and Garaudy. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or 1/2 or 1 unit.
393. **Classical Political Theory.** A consideration of major works of Greek and Roman political theory, and especially of their relevance to modern political analysis and action. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or 1/2 or 1 unit.
395. **Modern Political Theory.** A critical analysis of political theories from the sixteenth century to the present; focus on the development of such concepts as the nature of man, the role of the state, justice, legitimacy, obligation, individual rights, equality, and mechanisms of maintenance and change. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or 1/2 or 1 unit.
396. **Contemporary Political Theory.** Major tendencies in Western political theory since 1850; conservatism and constitutionalism; the religious interpretation of the state and economic institutions; Marxism, socialism, and communism; and antidemocratic thought and totalitarian regimes. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or 1/2 or 1 unit.
397. **American Political Theory.** Survey of American political thought from colonial times to the present. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or 1/2 or 1 unit.
398. **Theory and Practice of Democratic Government.** Theories of the nature and conditions of democracy; comparison and analysis of contemporary democratic institutions. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or 1/2 or 1 unit.
400. **Selected Topics in Political Theory.** Reading, analysis, and discussion of selected topics of political theory. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
401. **History of Political Theories.** Reading and analysis of the leading political thinkers from the Greeks to the middle of the seventeenth century. 1 unit.

402. **History of Political Theories.** Readings and analysis of the leading political thinkers from the middle of the seventeenth century to the present. 1 unit.
406. **Municipal Administration.** Position of cities in American governmental systems; governmental interrelationships; powers; services; and current municipal problems. 1 unit.
412. **Problems in State Government.** Research in selected topics in American state government. 1 unit.
420. **Formation of Public Policy.** Same as Labor and Industrial Relations 420. An examination of the institutional and dynamic forces that shape the making of policy and its administration in the United States; separation of powers, pressure groups, administrative and legislative procedures, and judicial activity. 1 unit.
423. **Proseminar in American Politics.** An intensive analysis of major institutions and processes of American politics (national, state, and local); research on selected topics in American government. 1 unit.
428. **Multivariate Analysis for Political Scientists.** Applied use of extended analysis of variance; multiple classification analysis, factor and small-space analysis, causal analysis, multiple regression, and selected topics for research. Prerequisite: Sociology 387 and Political Science 497, or consent of instructor. 1 unit.
430. **Proseminar in Comparative Politics.** Comparative political analysis in the context of the evolution of the social sciences and modern political science, with emphasis on theories of political action and their function in contemporary comparative studies. This course is designed as an introduction to area-oriented seminars and generally is a prerequisite for them. 1 unit.
435. **Problems in the Government of Soviet Russia.** Special topics relating to the government of the Soviet Union. 1 unit.
437. **Problems in Chinese Politics and Government.** Same as Asian Studies 437. Research in selected topics relating to the political system of China. Prerequisite: Credit or concurrent registration in Political Science 430, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
439. **Problems of African Politics and Government.** Analysis of political problems of African states. 1 unit. May be repeated to a maximum of 2 units.
440. **Comparative Politics and the Political Process.** The comparative study of selected national political systems or of specific institutional forces that influence the making and application of public policy in several countries. The countries studied and the legal and extralegal political agencies considered vary according to the person conducting the seminar. 1 unit. May be repeated to a maximum of 3 units.
441. **Politics in the Developing States.** Examination of the political processes in the developing countries; examination of the general problems arising in the transition from traditional societies to modern industrial states in order to describe the typical patterns of political change; and special attention given to contemporary literature and studies. Prerequisite: Political Science 430; consent of instructor. 1 unit.
442. **Problems of Latin American Politics and Government.** Special topics relating to Latin American politics and government; individual countries may be studied or comparative analysis of particular political and governmental functions or problems may be undertaken. Prerequisite: Political Science 430 and 441, or equivalent. 1 unit. May be repeated to a maximum of 2 units.
448. **Problems in Japanese Politics and Government.** Same as Asian Studies 448. Study of scholarly literature on modern Japanese politics and examination of selected problems in modern Japanese politics. Prerequisite: Credit or concurrent registration in Political Science 430, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
450. **Contemporary Governmental Problems.** Special problems of current importance designed especially for students not majoring in political science. 1 unit. May be repeated to a maximum of 3 units.
451. **Constitutional Law.** Research in selected topics in the American constitutional system. Prerequisite: Political Science 351 or equivalent. 1 unit.

- 453. Law, Policy, and Social Science.** The application of social science research techniques to improving legal procedure and legal substance; emphasis on constitutional law and other public law subjects, but also consideration of other fields of law. 1 unit.
- 460. Organizational Sciences, I.** Same as Business Administration 410, Psychology 453, and Sociology 456. See Business Administration 410.
- 465. Problems in Administrative Management.** Analysis of methods of applying administrative principles and procedures to operating problems in government agencies, such as methods of administrative coordination and control, intergovernmental cooperation, legislative-administrative relations, the organization of regulatory functions, and review of administrative decisions. Prerequisite: Political Science 361 or consent of instructor. 1 unit.
- 466. Current Administrative Theory.** A discussion of some recent trends in administrative opinion and practice on such questions as agency structure and functional activities; field and regional organization and relations; the role and functions of the executive; the process of decision making; the relations of line and staff activities; the communication and execution of policies and programs; and employee relations. 1 unit.
- 469. Collective Bargaining in Public Employment.** Same as Labor and Industrial Relations, Social Work, and Administration, Higher, and Continuing Education 497. See Labor and Industrial Relations 497.
- 480. Scope and Theory in International Relations.** Deals with the field of international relations, its relationship to political science and the other social sciences; treats the development of the field by examining major theories and approaches that have characterized it in the past, but with emphasis on contemporary theories and concepts. 1 unit.
- 481. Methodology in International Relations.** Deals with major research methodologies in contemporary international relations; includes case studies, aggregate data, content analysis, survey research, gaming and simulations, and causal modelling; and presumes knowledge of basic international relations theory. Prerequisite: Political Science 480. 1 unit.
- 483. United States Foreign Policies.** Study of selected current problems in foreign policy; use of power; problems of negotiation; relations with new states; and foreign aid. 1 unit.
- 484. International Relations: Special Problems in Theory and Research.** Advanced seminar on special topics in international relations. Prerequisite: Political Science 480 or 481, or consent of instructor. 1 unit. May be repeated under different instructors for a maximum of 3 units.
- 490. Proseminar in Political Behavior, I.** Interdisciplinary approaches to the analysis of political behavior; formation of opinions, interests, roles, and personality; applications of organization theory to political institutions; applications of conflict and bargaining theory to political processes; and systematic studies of the distribution of values. 1 unit.
- 491. Proseminar in Political Behavior, II.** Continuation of Political Science 490. Prerequisite: Political Science 490. 1 unit.
- 492. Problems of Explanation in Social Science.** Special topics in the methodology of social sciences, especially theory formation and theory testing. 1 unit.
- 493. Research in Selected Topics.** Research in selected topics by arrangement with the instructor. 1/2 to 3 units.
- 495. The Philosophy of Political Science.** Definitions of the scope and subject matter of political science; methodological issues in political science; major conceptions of methodology as embodied in current leading studies of politics; and the present state of research in political science. 1 unit.
- 496. Political Concepts: Formulation and Measurement.** Indicates the relevance of certain research techniques for answering questions of concern in political science; indicates the range of tools available to the student; and includes discussion of problems in concept formation. Current methods of concept measurement are

presented to the student in the context of political research problems. Prerequisite: Consent of instructor. 1 unit.

497. **Research Design and Techniques.** Introduction to problems of research design, data collection, data analysis and interpretation, sampling, and some simple measures of statistical association and significance. Prerequisite: Political Science 496. 1 unit.
498. **The Logic of Political Inquiry: Selected Topics.** Application of analytic principles and procedures developed in Political Science 495 to such topics as patterns of explanation; current theoretical perspectives; group theory, functionalism, systems theory, decision making, simulation, etc; the logic of judicial decisions; and justifications of political ideologies. This list is not exhaustive, nor will all of these topics be included each semester. Prerequisite: Political Science 495. 1 unit. May be repeated to a maximum of 2 units.
499. **Thesis Research.** 0 to 4 units

PORTUGUESE

(See Spanish, Italian, and Portuguese)

PRINTMAKING

(See Art and Design)

PSYCHOLOGY

Head of Department: Professor Emanuel Donchin

Department Office: 308 Psychology Building, 902 South Sixth, Champaign

100. **Introduction to Psychology.** Study of human behavior with special reference to perception, learning, memory, thinking, emotional life, and individual differences in intelligence, aptitude, and personality; emphasis on the scientific nature of psychological investigations; and discussion of research methods and the relation of their results to daily life and everyday problems. Lectures, discussions, and five hours of participation as a subject in psychological experiments. Not open to students electing Psychology 103 or 105. 3 hours. Psychology 101 may be taken concurrently for 1 hour additional credit.
101. **Theory and Practice of Psychological Research.** Consideration of research methods and problems of research design in psychology; participation in ongoing research of the staff of the department. Prerequisite: To be taken concurrently with Psychology 100, 103, or 105, or with the consent of the academic adviser of the Department of Psychology. 1 hour. May not be repeated.
102. **Psychology Orientation.** Lectures designed to acquaint the psychology concentrator with the various specializations available in the field, career exploration procedures, and a wide range of opportunities of special interest to psychology students. Recommended for freshmen in psychology. No credit.
103. **Introduction to Experimental Psychology.** An in-depth survey of basic topics in experimental psychology; emphasis on conditioning, learning, memory, motivation, perception, cognition, and animal learning with stress placed on the biological aspects of these problems. Lecture and laboratory. Not open to students electing Psychology 100 or 105. 4 hours. Psychology 101 may be taken concurrently for 1 hour additional credit.
105. **Elements of Psychology.** Description and explanation of the psychological principles of everyday living, with emphasis on how behavior is motivated, how

individuals learn intelligent behavior, personality, and applications of psychology to various social issues. Lectures, discussions, and five hours of participation as a subject in psychological experiments. This course may be substituted for Psychology 100 when the latter is listed as a prerequisite or a recommended elective. For placement purposes, enrollment is limited to students whose ACT composite score is 21 and below. Not open to students electing Psychology 100 or 103. 4 hours. Psychology 101 may be taken concurrently for 1 hour additional credit.

115. **Design and Interpretation of Psychological Research.** Introduction to methodology for laboratory and field research; basic descriptive and inferential statistics emphasizing interpretation of statistical results rather than computation; and discussion of illustrative research from several areas of psychology. Prerequisite: Psychology 100, 103, or 105; or consent of departmental academic advisor. 3 hours.
158. **Personal and Social Implications of Machines.** Examines human interaction with modern machines; topics include a comparison of the capabilities of humans and machines, effects of automation, characteristics of good machines and workplaces, selection and training of effective users of machines, and research, including new machines, for handicapped populations. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Introduction to Social Psychology.** Systematic study of social factors in individual and group behavior; attention to social perception, motivation, and learning; attitudes, norms, and social influence processes; the development and dynamics of groups; and the effects of social and cultural factors on the individual. Credit is not given for both Psychology 201 and Sociology 201. Prerequisite: Psychology 100, 103, or 105. 3 hours.
205. **Individual Differences in Intelligence.** Discussion of the nature of psychological tests; theories of intelligence; the nature-nurture problem in human abilities; sex, socioeconomic, and race differences; testing and social policies; and policy implications of individual and group differences. Lecture and discussion. Prerequisite: Psychology 100, 103, or 105, or consent of instructor. 3 hours.
210. **The Brain and the Mind.** A survey of current knowledge and speculation regarding the brain's role in perception, motivation, sexual behavior, thinking, memory, and learning, based upon human clinical data and research in animal models. Prerequisite: Psychology 100, 103, or 105, or consent of instructor. 3 hours.
211. **Techniques of Biological Psychology.** Introduction to research techniques used in the physiological study of mental processes; includes recording "brain waves," behavioral analysis of drug and lesion effects, anatomy of the brain, hormones and behavior, and related topics. Prerequisite: Credit or concurrent registration in Psychology 210, or consent of instructor. 2 hours.
216. **Child Psychology.** Study of the psychological development of the child. Prerequisite: Psychology 100, 103, or 105. 3 hours.
217. **Comparative Development.** Survey of phylogenetic and ontogenetic development of behavior. The first part of the course considers the comparative psychology of representative phyla, with special emphasis on the development of sensorimotor coordination, motivation, and learning. The second half of the course is concerned with development of behavior in the individual organism, with most attention devoted to behavioral changes during the life span of vertebrate organisms. Prerequisite: Psychology 100, 103, or 105. 3 hours.
224. **Cognitive Psychology.** Introduction to the psychological study of human information processing and memory; acquisition, retrieval, and forgetting; and general knowledge, concepts, reasoning, and related issues in cognition. Prerequisite: Psychology 100, 103, or 105. 3 hours.
230. **Perception and Sensory Processes.** Survey of the experimental psychology of sensory and perceptual processes and behavior; emphasis on the contribution of behavior science to understanding subjective experience of the physical and social environment. Prerequisite: An introductory course in psychology, physiology, or zoology. 3 hours.

- 231. Research Methods in Experimental Psychology.** Studies experimental laboratory methods as related to applied and basic psychological questions; material includes: research methodology, scientific problem solving, literature search, scientific writing, experimental design, basic data analysis, and research laboratory experience. Prerequisite: Psychology 100, 103, or 105. 4 hours.
- 233. Descriptive Statistics.** Descriptive statistics, including measures of central tendency and dispersion, correlation, probability, transformations, and basic distribution theory; basic principles of sampling and research design. Laboratory includes discussion of problems and application of statistical methods to data from experiments and surveys. Prerequisite: Psychology 100, 103, or 105; college algebra or equivalent; or consent of departmental academic adviser. 3 hours. Students may not receive credit for Psychology 233 and Psychology 235, Economics 171 or 172, Mathematics 161, Sociology 185 or 385, or Educational Psychology 390.
- 234. Inferential Statistics.** Inferential statistics, including sampling distributions estimation, hypothesis testing, regression, correlation, and basic analysis of variance procedures. Laboratory includes discussion of problems and application of statistical methods to data from experiments and surveys. Prerequisite: Psychology 233. 2 or 3 hours. Students who have earned credit in Economics 171 or 173, Mathematics 161, Sociology 185, or Educational Psychology 390 receive 2 hours credit in Psychology 234. Students may not receive credit for both Psychology 234 and 235.
- 235. Introduction to Statistics.** Development of skill and understanding in the application of statistical methods to problems in psychological research; topics include descriptive statistics, probability, estimation, basic inferential methods, regression, correlation, and basic analysis of variance procedures. Laboratory includes discussion of problems and application of statistical methods to data from experiments and surveys. Prerequisite: Psychology 100, 103, or 105; college algebra or equivalent; or consent of departmental academic adviser. 2 or 5 hours. Students who have earned credit in Economics 171 or 173, Mathematics 161, Sociology 185 or 385, or Educational Psychology 390 receive 2 hours credit in Psychology 235. Students may not receive credit for Psychology 235 and Psychology 233 or 234.
- 238. Abnormal Psychology.** Conceptions and facts about disordered behavior, including psychoses, neuroses, and other patterns of psychological disturbance. Prerequisite: Psychology 100, 103, or 105. 3 hours.
- 245. Industrial Organizational Psychology.** A systematic study of the application of psychological methods and principles in business and industry; emphasis on personnel selection and factors influencing efficiency. Prerequisite: Psychology 100, 103, or 105; credit or concurrent registration in a statistics course. 3 hours.
- 246. Vertebrate Social Organization.** Same as Anthropology, Ecology, Ethology, and Evolution and Sociology 246. See Ecology, Ethology, and Evolution 246.
- 248. Psychology of Learning and Memory.** Survey of basic phenomena in learning and memory emphasizing experimental data from animal and human research. Prerequisite: Psychology 100, 103, or 105. 3 hours.
- 250. Psychology of Personality.** The study of personality from various points of view: biological, experimental, social, and humanistic; surveys theory and empirical research in the study of personality. Prerequisite: Psychology 100, 103, or 105. 3 hours.
- 258. Human Factors in Man-Machine Systems.** Examination of equipment and training variables that influence the human operator in man-machine systems; includes the nature of man-machine systems, the capabilities of men and machines, and simulation for design decision; and research and principles for the design and use of symbolic and pictorial displays, control systems, and simulators for training. Prerequisite: Psychology 100, 103, or 105. 3 hours.
- 261. Sign Language and Nonverbal Communication in Man and Animals.** Surveys nonverbal communication systems: natural animal communication, human sign languages (especially American Sign Language), human facial expression, gesture and body language; examines organization of animal and of human communication, and considers communication by animals tutored in human sign language.

- Prerequisite: A course in introductory psychology, linguistics, or speech communication; or consent of instructor. 3 hours.
289. **Introduction to Quantitative Theories in Psychology.** A survey of major quantitative theories and methodologies in psychology: models of human judgment, decision, and attitude formation, unidimensional and multidimensional scaling of stimulus domains, signal detection theory, probability and computer models of learning and higher mental processes, quantitative theories of mental test scores, and multidimensional models of ability, attitude, and personality structure. Prerequisite: Psychology 235 or equivalent. 4 hours.
290. **Special Topics.** Supervised participation in research and scholarly activities usually as an assistant to an investigator. Prerequisite: Ten hours of psychology or cognate area, or written consent of instructor. 1 to 4 hours. May be repeated to a maximum of 9 hours.
291. **Honors Individual Study.** Prerequisite: Junior standing; admission to psychology honors program. 2 to 4 hours. May be repeated to a maximum of 10 hours.
293. **Honors Senior Thesis.** Planning, researching, and writing of an undergraduate honors thesis, under supervision of a faculty member, on a problem of appropriate scope and character. Prerequisite: Psychology 297. 2 to 4 hours.
294. **Individual Topics.** Supervised independent investigation of special topics in psychology; requires a written report with a final copy submitted for departmental records. Prerequisite: Ten hours of psychology or cognate area, or written consent of instructor. 1 to 4 hours. May be repeated to a maximum of 9 hours.
297. **Junior Honors Seminar.** Seminar on experimental methods and contemporary psychological research. Prerequisite: Junior standing and admission to departmental honors program. 0 to 4 hours.
298. **Senior Honors Seminar.** Continuation of Psychology 297. Prerequisite: Psychology 297. 0 to 4 hours.
301. **The Computer as a Laboratory Instrument.** The computer as a control device in bio-behavioral experiments; data acquisition using computer-controlled devices; and includes introduction to computer architecture and application language programming, study of recent experimental literature for which the computer was an indispensable tool, and practicum utilizing laboratory computers available at the Department of Psychology. Prerequisite: Computer Science 103 or equivalent; two 200-level psychology courses or consent of instructor. 4 hours or 1 unit.
306. **Advanced Quantitative Methods, I.** Advanced techniques in inferential statistics used in psychological research; topics include basic analysis of variance designs and nonparametric methods; and laboratory emphasizing application of statistical methods to behavioral data and use of statistical computer programs. Prerequisite: Twelve hours in psychology and Psychology 234 or 235, or equivalent. 4 hours or 1 unit. Students may not receive credit for both Psychology 306 and Sociology 386.
307. **Advanced Quantitative Methods, II.** Continuation of Psychology 306. Advanced topics, including partial and multiple correlation, analysis of covariance, multivariate ANOVA, factor analysis, scaling, and Bayesian inference; includes laboratory. Prerequisite: Psychology 306. 4 hours or 1 unit. Students may not receive credit for both Psychology 307 and Sociology 387.
311. **Laboratory in Physiological Psychology.** Research on classical and current problems; emphasis on the nervous and endocrine systems in information processing and in the regulation of behavioral adaptation; and examples from sensation, perception, motivation, emotion, and learning. Laboratory. Prerequisite: Psychology 211. 4 hours, or 1/2 or 1 unit.
312. **Movement Notation.** Same as Dance 349 and Physical Education 365. See Physical Education 365.
313. **Drugs and Behavior.** Behavioral and physiological effects of chemicals either used therapeutically to treat psychological disorders or that may be abused for their psychotropic effects; emphasizes mechanisms and models for the study of drug action. Prerequisite: Psychology 210, Ecology, Ethology, and Evolution 353/Psychology 343, or Biology 303, or consent of instructor. 3 hours or 3/4 unit.

318. **Psychology of the Infant.** Early infant behavior, emphasizing critical evaluation of the various research techniques; prenatal and perinatal influences, ontogeny of psychological processes, environmental determinants, and infant assessment. Prerequisite: Psychology 216. 3 hours or 1 unit.
319. **Day Care Practicum.** Same as Human Development and Family Ecology 319. Application of psychological theory in day care settings; supervised experiences focusing on the relation between aspects of child development and the planning and carrying out of effective day care programs. Typical sections offered include experience with infants, preschool, handicapped, hospitalized, and maltreated children. Prerequisite: Psychology 216 and acceptance into Day Care Supervisor Training area of emphasis or consent of instructor. 2 to 4 hours or 1/2 to 1 unit. May be repeated.
320. **Principles of Psychophysiology.** Theoretical and practical aspects of human psychophysiology; measurement techniques and the application of psychophysiological principles to problems in developmental, clinical, social, and experimental psychology. Prerequisite: Psychology 234 or 235, six hours of psychology, and an introductory course in physiology. 3 hours or 1 unit.
323. **Language Acquisition.** Same as Linguistics 323 and Communications 323. Survey of theory and research on the acquisition of language, concentrating on the acquisition of a first language by the young child. Prerequisite: Six hours of psychology or linguistics above the 100-level, or consent of instructor. 3 hours or 1 unit.
324. **Psychology of Thinking.** Survey of problems, experimental methods, and research findings in human thinking; emphasis on concept formation, problem solving and decision making, and creativity. Prerequisite: Psychology 235. 3 hours or 1 unit.
325. **Psychology of Language.** Survey of theory and research in the psychology of language; topics include relation of linguistics and psychology, language development, and influence of language on perception, memory, and thought. Credit not given for both Psychology 325 and Linguistics 325. Prerequisite: Six hours of psychology or consent of instructor. 3 hours or 1 unit.
326. **Motivation and Emotion.** The nature and development of emotion, attitude, and motive, and the role of these processes in social adjustment. Prerequisite: Six hours of psychology. 3 hours, or 1/2 or 1 unit.
330. **Experimental Psychology, I.** Survey of problems, experimental methods, and research findings in the fields of psychophysics, sensory processes, perception, judgment, and thinking. Prerequisite: Psychology 230; a knowledge of statistics equivalent to that from Psychology 235. 4 hours or 1/2 unit.
331. **Experimental Psychology, II.** A lecture-laboratory course concentrating on research problems and methodology in both animal and human learning; concentration on laboratory techniques and reporting experimental results. Prerequisite: Psychology 248; a knowledge of statistics equivalent to that from Psychology 235. 4 hours or 1/2 unit.
332. **Research Methods in Social Psychology: Laboratory Methods.** Same as Sociology 332. Lecture and laboratory in the methods and techniques of social psychological research in laboratory settings. Prerequisite: Psychology 201 or Sociology 201; Psychology 235 or Sociology 184 and 185. 4 hours, or 1/2 or 1 unit.
333. **Research Methods in Social Psychology: Natural Settings.** Methods and techniques of social psychological research in natural settings. Students formulate and carry out research problems using procedures appropriate for research in natural settings. Prerequisite: Psychology 201 or Sociology 201; Psychology 235, or Sociology 184 and 185. 4 hours or 1 unit.
335. **Mathematical Formulations in Psychological Theory.** Illustration of mathematical formulations by studying quantitative treatments of various psychological processes; emphasis on learning theory, psychophysical laws, and other selected topics; and the development of simple mathematical tools as required. Prerequisite: Elementary statistics of probability, elementary calculus, and 6 hours of psychology, or consent of instructor. 3 hours, or 1/2 or 1 unit.

336. **Clinical Psychology.** Survey of methods in clinical psychology; description, demonstration, and critical review of procedures used by clinical psychologists in the analysis and modification of disordered behavior. Prerequisite: Psychology 238. 3 hours, or 1/2 or 1 unit.
337. **Behavior Modification.** Introduction to the principles and application of behavior modification; includes methods of behavioral assessment, positive and negative reinforcement, punishment and extinction, token economics, programmed instruction, and desensitization; and emphasizes establishing behavioral objectives in the modification of child and adult clinical problems. Prerequisite: Psychology 248. 3 hours or 1 unit.
339. **Community Psychology.** Introduction to the concepts and the application of psychological knowledge to community problems; stress on a broad definition of mental health, a social learning, and a preventive, rather than an ameliorative, approach to community problems; and emphasis on community organization and innovations in the delivery of services to those populations which normally fall outside the service network, e.g., the poor, minority groups, and other "marginal groups." Prerequisite: Sophomore standing; Psychology 100, 103, or 105. 3 hours, or 1/2 or 1 unit.
340. **Community Projects.** Principles of psychology applied to service problems in the community; students serve as nonprofessional mental health workers in supervised experiences in schools, hospitals, and other nontraditional settings. Prerequisite: Psychology 100 and 339; junior or senior standing; and consent of instructor. 4 hours or 1 unit.
341. **Advanced Community Projects.** Advanced discussion and practicum on principles of psychology which may supplement mental health and other human services in a community. Students serve as nonprofessional mental health workers in supervised experiences in school hospitals and other nontraditional settings. Prerequisite: Psychology 340 and consent of instructor. 4 hours or 1 unit.
342. **Behavior-Genetic Analysis.** Same as Anthropology 342 and Ecology, Ethology, and Evolution 350. Concepts, methods, and problems in the analysis of relations between genetic systems and animal behavior. Prerequisite: Anthropology 240 or Biology 106 or 210. 3 hours or 3/4 unit.
343. **Hormones and Behavior.** Same as Ecology, Ethology, and Evolution 353. See Ecology, Ethology, and Evolution 353.
345. **Laboratory in Comparative Psychology.** Animal behavior with particular reference to the behavior of vertebrates. Prerequisite: Six hours of psychology and an introductory course in biology, or consent of instructor. 4 hours, or 1/2 or 1 unit.
347. **Behavior Genetics Laboratory.** Same as Anthropology 337 and Ecology, Ethology, and Evolution 352. Examination of the relations between genetic mechanisms, population structure, and individual differences in behavior; laboratory work on techniques of behavior study and genetic analysis. Prerequisite: Concurrent registration in Psychology 342. 2 hours or 1/2 unit.
348. **Theories of Learning.** A critical analysis of selected theories of learning; consideration of problems of theory construction in the context of past controversies in learning as well as recent theories of animal and human learning. Prerequisite: Psychology 248 or Educational Psychology 211. 3 hours, or 1/2 or 1 unit.
350. **Laboratory in Personality.** The study of personality emphasizing active participation in designing, conducting, analyzing, and presenting of research; lectures concern the practical aspects of research methodology and the philosophy of personality research; and laboratory involves conducting original research in small groups. Prerequisite: Psychology 235 or equivalent; and Psychology 250 or consent of instructor. 4 hours or 1 unit.
352. **Attitude Theory and Change.** Same as Communications 352 and Sociology 352. Comprehensive analysis of theories of attitude acquisition, organization, and change; emphasis on attitude change through communication and effects of persuasive communication on public opinion. Prerequisite: Psychology 201 or Sociology 201, or a comparable course of introduction to social psychology. 3 hours, or 1/2 or 1 unit.

353. **Social Perception.** Analysis of theory and research on problems related to the manner in which persons judge themselves and others on the basis of information received; topics include impression formation integration, determinants of interpersonal attractions, and attribution processes. Prerequisite: Psychology 201 and 235, or graduate standing, or consent of instructor. 3 hours or 1 unit.
354. **Small Group Behavior.** The nature of interpersonal transactions; theories and methods for their investigation; and consideration of both individual and social determinants of such transactions. Prerequisite: Psychology 201. 3 hours, or 1/2 or 1 unit.
355. **Industrial Social Psychology.** Same as Labor and Industrial Relations 355. Social psychological research and theory applied to industrial problems; emphasis on interaction and communication theory, role theory, leadership theory, motivational and perceptual theory, and group structure theory as an aid in understanding and analyzing industrial problems. Prerequisite: Psychology 201 or 357. 3 hours, or 1/2 or 1 unit.
356. **Human Performance and Information Processing.** Human capabilities and limitations in processing information; models and theories of signal detection, stimulus analysis, short-term memory, choice reaction time, decision-making, attention, and motor performance are evaluated with respect to experimental data; emphasizes theory, although implications for design of man-machine systems are considered. Prerequisite: Psychology 100, 103, or 105 or consent of instructor. 3 hours or 1 unit.
357. **Psychology of Industrial Relations.** Same as Labor and Industrial Relations 357. An analysis, in terms of the behavior of individuals, of the causes and possible solutions of industrial conflict. Offered in the special interest of industrial relations, commerce, and engineering students. Prerequisite: Psychology 100 or equivalent. 3 hours, or 1/2 or 1 unit.
359. **The Social Psychology of Organization.** Same as Sociology 359. Analysis of the interrelationships between social and psychological factors, and organizational structure and process; emphasis on sources, consequences, and modes of resolution of intraindividual, intraorganizational, and interorganizational conflict. Prerequisite: Sociology 322 or Psychology 355. 3 hours or 1 unit.
360. **Modern Viewpoints in Psychology.** Examines modern behaviorism, psychoanalysis, and cognitive psychology, viewed as conceptions of man, styles of theorizing and investigative strategies; critically evaluates the more influential theories and research. Prerequisite: 6 hours of psychology. 3 hours, or 1/2 or 1 unit.
361. **Advanced Developmental Psychology.** Theory and research on psychological development from birth through adolescence; maturation of behavior systems; the role of social learning in development; the effects of early experience on personality development; and critical stages in development. Prerequisite: Psychology 216 or 217; a course in statistics. 3 hours, or 1/2 to 1 unit.
362. **Cognitive Development.** Survey of theory and research on the development of problem-solving skills, memorial and metamemorial processes, logical thinking, and language. Prerequisite: Psychology 216 and 235. 3 hours or 1 unit.
363. **Laboratory in Developmental Psychology.** Experience in designing, carrying out, and reporting an original research project. Prerequisite: Psychology 216 and 235, or equivalent. 4 hours or 1 unit.
365. **Personality and Social Development.** Same as Educational Psychology 315. Major theories of personality and social development, with attention to processes of social learning, individual differences in personality development, and outcomes of social development; applications to school, home, and other field settings. Prerequisite: Psychology 216 or Educational Psychology 236, or equivalent. 3 hours or 1 unit.
371. **Psychological Factors in Political Behavior.** An application of psychological methods and theories to the study of political behavior; attention to research methods and to content problems in voting behavior and national security policy. Prerequisite:

Six hours beyond 100-level courses in psychology, political science, or sociology. 3 hours, or 1/2 or 1 unit.

373. **Theory and Method in the Cross-Cultural Study of Individual Social Behavior.** Same as Anthropology 373. Centers on cross-cultural study of substantive areas such as personality, motivation, socialization, interpersonal behavior, psychological environments, cognition and cognitive development, ethnocentrism and stereotypes, and visual perception; emphasis on methodological limitations and contributions of cross-cultural study; and discussion of current problems and research. Prerequisite: Six hours of psychology or anthropology, or consent of instructor. 3 hours or 1 unit.
380. **Introduction to Mental Health Programs.** Historical foundations, schema for classification of mental health delivery systems, contemporary treatment strategies, ethical and legal issues, and alternatives to institutional treatment; includes field trips to a variety of treatment facilities. Prerequisite: Credit or registration in Psychology 336 and 337. 3 hours or 1 unit.
381. **Beginning Practicum in Mental Health.** Didactic instruction and supervised practicum experience in a community treatment agency; self-report, observational, and physiological approaches to client assessment; and lecture-discussion and direct agency experience each week. Prerequisite: Psychology 380. 4 hours or 1 unit.
382. **Issues in Mental Health Work, I.** Basic behavioral principles useful in formulating, carrying out, and evaluating a treatment plan; focuses on the training of nonprofessionals (e.g., parents) or staff members in treatment roles. Prerequisite: Psychology 381 and concurrent registration in Psychology 383. 2 hours or 1/2 unit.
383. **Advanced Practicum in Mental Health, I.** Supervised practicum experiences in a community agency which correspond to didactic material presented in the companion course, Psychology 382. Prerequisite: Concurrent registration in Psychology 382. 4 hours or 1 unit.
384. **Issues in Mental Health Work, II.** Procedural alternatives to the operant approaches presented in Psychology 382 and 383; students are encouraged to focus their interests on a particular client population; and lecture-discussion with individualized reading programs. Prerequisite: Concurrent registration in Psychology 385. 2 hours or 1/2 unit.
385. **Advanced Practicum in Mental Health, II.** Supervised practicum experiences in a community agency corresponding to didactic material presented in the companion course, Psychology 384; twelve-hour-per-week assignments reflect student interests in specific population. Prerequisite: Psychology 382 and 383, and concurrent registration in Psychology 384. 4 hours or 1 unit.
390. **Laboratory in Psychological Measurement and Test Development.** The measurement of human behavior in psychological studies; the construction and use of psychological tests; introduction to tests of intelligence, achievement, personality, and interest; and practice in test construction, administration, and validation. Lectures and laboratory. Prerequisite: A knowledge of statistics equivalent to that from Psychology 235. 4 hours or 1 unit.
396. **Seminar in Psychology.** Special topics in the field of psychology. Prerequisite: Junior standing and consent of instructor. 2 to 4 hours, or 1/2 to 1 unit. May be repeated to a maximum of 12 hours or 3 units

Note: The prerequisites stated below apply to graduate majors in psychology. Students minoring in psychology may, by special permission of instructors, enroll in certain of these courses without having met all the prerequisites.

402. **Systematic Psychology.** Analysis of methodological problems, including forms and roles of models and theories, status of unobservable organismic events, validation of measures and manipulations, possible forms of laws, forms of data language, and status of private reports; evaluation of the approaches to these problems provided by several varieties of behaviorism, standard and omnitheoretic views in the philosophy of science, and network methods. Prerequisite: Twelve hours of psychology. 1 unit.

405. **Neurochemistry.** Same as Physiology 405. The fundamentals of neurochemistry and topics of current interest; detailed study of chemical transmission, including metabolism, neuroanatomical distribution, pharmacology, and functions of neurotransmitters. Lecture-seminar. Prerequisite: Biochemistry 350, Psychology 210 or 407, or consent of instructor. 3/4 unit.
406. **Psychological Scaling: Unidimensional Methods.** Same as Sociology 406. Measurement of psychological values; centrally concerned with how subjective values of multiple physical dimensions combine to produce unidimensional subjective values; and includes conjoint and functional measurement theory and methods, theoretical models of judgment and the analysis of empirical structures, and applications of scaling models to problems in social, personality, perception, and cognitive psychology. Prerequisite: Psychology 307, Sociology 387, or equivalent course in quantitative methods. 1 unit.
407. **Functional Neuroanatomy.** Same as Anatomical Sciences 407. See Anatomical Sciences 407.
408. **Design of Experiments in Psychology.** Advanced experimental designs in psychological research; special methods of data analysis. Prerequisite: Psychology 307. 1 unit.
409. **Psychological Scaling: Multidimensional Methods.** Same as Sociology 409. Basic scaling theory; metric, non-metric, and individual differences multidimensional scaling models and methodology, emphasizing underlying assumptions and interpretation; and applications of scaling methods to measurement problems in social and personality psychology, perception, cognition, and sociology. Prerequisite: Psychology 307, Sociology 387, or equivalent course in quantitative methods. Psychology 406 is recommended but not required. 1 unit.
410. **Advances in Psychobiology: Introduction for Graduate Students.** Survey of research on brain mechanisms of behavior; emphasizes current theoretical and methodological issues. Prerequisite: Graduate standing or consent of instructor. 1/2 unit.
411. **Advanced Physiological Psychology.** Detailed examination of the physiological mechanisms in behavior; emphasis on research methodology and contemporary literature in the physiology of motivation, learning, perception, and emotion; and includes laboratory demonstrations and problems. Prerequisite: Twelve hours of psychology, including Psychology 311 or equivalent. 1/2 or 1 unit.
414. **Experimental Personality Research.** Laboratory training course emphasizing the application of psychophysiological techniques to personality and related areas; combines critical surveys of recent literature with laboratory training and class projects. Prerequisite: Psychology 307 and 320; consent of instructor. 1 unit.
415. **Experimental Sensory Psychology.** A systematic study of sensory processes, including vision, audition, gustation, olfaction, and somesthesia; emphasis on experimental methods, research findings, and theory. Prerequisite: Twelve hours of psychology, including a laboratory course in experimental psychology. 1 unit.
416. **Perception.** Systematic study of methods and research findings in the field of human perception, together with an evaluation of theoretical interpretations. Prerequisite: Twelve hours of psychology. 1 unit.
417. **Experimental Psychology of Learning, I: Basic Processes.** Study of experimental investigation of basic learning processes; emphasis on the nature of the problems, experimental procedures, and theoretical significance. Prerequisite: Twelve hours of psychology. 1 unit.
418. **Experimental Psychology of Learning, II: Human Learning.** Data and theories of verbal learning; verbal mediators and their functions in learning and retention; transfer of training; short-term and long-term memory; and conceptualizations of the forgetting process. Prerequisite: Twelve hours of psychology or consent of instructor. 1 unit.
419. **Advanced Comparative Psychology.** A critical survey of techniques, results, and problems in the study of animal behavior and human behavior from the

comparative-evolutionary point of view; laboratory demonstrations and individual research problems. Prerequisite: Twelve hours of psychology or biology. 1 unit.

- 420. Developmental Psychophysiology.** A laboratory training course emphasizing the application of psychophysiological research techniques in the study of the development of psychological processes; combines critical surveys of recent research literature with laboratory training in representative techniques dealing with specific age ranges. Prerequisite: Psychology 320. 1 unit.
- 424. Developmental Psycholinguistics.** Same as Communications and Linguistics 424. Examination of empirical and theoretical literature on the acquisition of language; emphasis on universal patterns in the acquisition of a first language and on a consideration of explanations, both psychological and linguistic, for these patterns. Prerequisite: Linguistics 325, Psychology 325 or 362, or consent of instructor. 1 unit.
- 425. Psycholinguistics.** Same as Communications 425 and Linguistics 425. A critical survey of methods and theories in the psychological study of the communication process; emphasis on linguistic, information-theory, and learning-theory approaches; psycholinguistic analysis of language decoding and encoding; and the development and measurement of symbolic processes, including meaning. Prerequisite: Consent of instructor. 1 unit.
- 426. Psycholinguistics.** Same as Communications 426 and Linguistics 426. Offers a critical review of psychological theories of language performance in relation to linguistic theories of competence; students will be required (a) to write a critical review of a major psycholinguistics theory and (b) to design a psycholinguistic experiment for testing hypotheses in their own area of special interest, presenting it in professional style. 1 unit.
- 427. Engineering Psychology.** Experimental psychology applied to the study of man-machine systems; considers research issues, methodological matters, and principles of design and training in terms of contemporary aircraft, highway, industrial, and health-care systems. Prerequisite: Psychology 258 or 356, or consent of instructor. 1 unit.
- 428. Cognitive Determinants of Behavior.** Theoretical and experimental analyses of the role of decision processes and causal attributions in the control of behavior; examines a variety of subparadigms from several areas of psychology. Prerequisite: Twelve hours of psychology. 1 unit
- 429. Second Language Acquisition and Bilingualism.** Same as Linguistics 429. See Linguistics 429.
- 430. Foundations of Industrial-Organizational Psychology.** Same as Labor and Industrial Relations 430. Theoretical and empirical foundations of various content areas in industrialorganizational psychology; sample topics include employee selection and placement, training, human factors engineering, work motivation, employee attitudes, leadership, and organizational theory. Prerequisite: Twelve hours of psychology or consent of instructor. 1 unit.
- 431. Psychological Measurement in Industry.** Application of psychometric methods and the finding of differential psychology to the selection, classification, and performance evaluation of industrial personnel. Prerequisite: Psychology 307 or equivalent. 1 unit.
- 432. Introduction to Clinical Psychology Practicum.** Supervised practice in mental health delivery services; includes assessment and modification of problem behaviors in short-term treatment programs and beginning experience in school and community consultation; and emphasizes the development of skills in interviewing, conceptualization of problem behaviors, report writing, and effective staff interactions. Prerequisite: First- year graduate standing in clinical psychology and credit or registration in Psychology 438. 1 unit.
- 433. Internship in Industrial/Organization Psychology.** Supervised practice in organizational practice and research, implementation of programs, evaluation, feedback of survey results, applied assessments, assistance in EAP programs, and development of personnel guidelines; emphasizes applications of principles and procedures. Offered in special interest of graduate students in I/O psychology

- program. Prerequisite: Graduate standing in Psychology, credit or registration in Psychology 430, and consent of instructor. 1 unit.
435. **Motivation and Morale in Industry.** Same as Labor and Industrial Relations 435. Concepts and methods in the study of motivation of employees; determinants of employee attitudes and job satisfaction; and modification of attitudes and morale. Prerequisite: Four units of graduate credit in psychology or consent of instructor. 1 unit.
436. **Mathematical Models in Psychology.** Recent developments in mathematical models in psychology; special emphasis on human learning, higher processes, and modern psychophysics. Prerequisite: One year of calculus and Psychology 306 and 307, or consent of instructor. 1/2 or 1 unit.
438. **Introduction to Clinical Psychology, I.** Introduction to clinical psychology as a science and profession; lectures, discussion, demonstrations, and field observations provided for an overview of clinical psychology. Prerequisite: Graduate standing in clinical psychology; consent of instructor. 1 unit.
439. **Introduction to Clinical Psychology, II.** Continuation of introductory sequence in clinical psychology; discussion of logical issues in assessment, disposition, and behavior change; and initiation of preliminary training in interview and observational methods. Prerequisite: Psychology 438. 1 unit.
441. **Personality and Behavior Dynamics.** Theory and research in personality, emphasizing personality as individual differences among persons and personality as attributed to persons by others; explores the measurement, antecedents, and consequences of such differences and attributions. Prerequisite: Twelve hours of psychology. 1/2 or 1 unit.
443. **Clinical Assessment.** Instruction and practice in the administration and interpretation of individual tests of general intelligence, special abilities, and achievement. Prerequisite: Twelve hours of psychology, including Psychology 390 or equivalent; Psychology 432 and 439. 1 unit.
444. **Advanced Topics in Clinical and Personality Assessment.** Current issues in measurement in the clinical, personality, and social areas; topics vary, but include generalizability theory, individual difference-situation interactions, theories of validity and reliability, and the assessment of social interactions and environments. Prerequisite: Consent of instructor. 1/2 or 1 unit.
445. **Advanced Behavior Modification.** A critical survey of issues, principles, practice, and research related to modifying human behavior; covers psychotherapeutic and somatic approaches; symptomatic relief and personality-restructuring; goal-orientations; and individual family, group, milieu, and preventive community intervention. Prerequisite: Psychology 444; concurrent registration in Psychology 447 strongly recommended. 1 unit.
446. **Laboratories in Clinical Psychology.** Intensive practice in techniques of clinical assessment and behavior modification with emphasis on recent innovations; small sections of the course formed according to the specialized interests of students and staff. Prerequisite: Psychology 432 and 445, or consent of instructor. 1/2 to 1 unit.
447. **Internship.** Supervised field experience in clinical psychology. Prerequisite: Consent of instructor. 0 to 4 units.
449. **The Use of Drugs in the Treatment of Behavioral Disorders.** Clinically important psychoactive drugs with respect to their proper role in the treatment of mental illness, therapeutic effectiveness, and research basis for current use; includes a brief review of basic neurochemistry, the amine hypothesis of the etiology of mental illness, and research methodology in psychopharmacology. Prerequisite: Second-year graduate standing in clinical psychology or consent of instructor. 1/2 unit.
450. **Community Psychology and Social System Change.** Intensive examination of the historical antecedents, conceptual models, strategic tactics, and evaluation methods of planned social and ecological change; focuses on the role of the community psychologist in such endeavors; and reviews interventions in several social systems, such as criminal justice education, employment, and mental health. Prerequisite:

Psychology 339 or equivalent; graduate standing in psychology or consent of instructor. 1/2 or 1 unit.

451. **Theory and Method in Social Psychology, I.** First of two- course sequence for first-year graduate students in social psychology. Advanced theoretical and research approaches to a broad range of issues in social psychology; participation and seminar presentations by social psychology program faculty. Student participates in seminar presentations and develops and conducts a research study in conjunction with one or more faculty members. Prerequisite: Consent of instructor. 1 unit.
452. **Theory and Method in Social Psychology, II.** Second of a two-course sequence for first-year graduate students in social psychology. Advanced theoretical and research approaches to a broad range of issues in social psychology; participation and seminar presentations by social psychology program faculty. Each student participates in seminar presentations and develops and conducts a research study in conjunction with one or more faculty members. Prerequisite: Consent of instructor. 1 unit.
453. **Organizational Sciences, I.** Same as Business Administration 410, Political Science 460, and Sociology 456. See Business Administration 410.
455. **Research Methods in Organizational Psychology.** Discussion and analysis of strategies, methods, and techniques of organizational psychological research; emphasis on methods for researching behavioral determinants within interdependent organizational roles. Prerequisite: Psychology 355 or 359, or consent of instructor. 1 unit.
456. **Attitude Measurement and Behavioral Prediction.** Same as Communications 456. Comprehensive examination of the theory and method of attitude measurement and its implications for behavioral prediction; emphasis on the attitude concept and the validity of behavioral criteria. Prerequisite: Consent of instructor. 1 unit.
457. **Theory and Research in Organizational Psychology.** Theory and research on the psychological processes involving the demands of organizations on the behavior of individuals; emphasis on the processes of power, authority, influence, leadership, communications, decision making, and organizational change. Prerequisite: Psychology 455 or consent of instructor. 1 unit.
458. **Advanced Problems in Attitude Research.** Intensive analyses of recent developments in attitude theory and research; emphasis on the attitude-behavior relationship; and examination of theories of attitude and attitude change with respect to their utility in predicting and changing social behavior. Prerequisite: Consent of instructor. 1 unit.
459. **Advanced Problems in Research on Groups.** Intensive examination of current research and theory on structure, process, and performance of groups; critical examination of recent research and theoretical literature; and development of research designs for related issues in the field. Prerequisite: Consent of instructor. 1 unit.
460. **Motivation and Personality Development in Children.** Theory, method, and research on the interaction of motivational, personality, and learning processes and development in children; emphasis on experimental studies and a social learning theory approach. Class projects involve some laboratory work with children. Prerequisite: Twelve hours of psychology; consent of instructor. 1 unit.
462. **Human Abilities.** Analysis of individual differences in human abilities, including historical background, measurement methodology, and functional correlates of abilities; consideration of the use of ability measures in both experimental and applied research. Prerequisite: Psychology 307 or equivalent. 1 unit.
463. **Research Methods in Clinical Psychology and Personality.** The logical analysis of clinical inferences and their role in research; problems and methods in the investigation of the development, dynamics, and structure of personality; and research in psychotherapy. Prerequisite: Psychology 306. 1 unit.
464. **Advanced Problems in the Study of Individual Social Behavior.** An intensive examination of current research into one or more of the following areas: social perception and cognition, social motivation, social learning, and environmental factors in social behavior; critical examination of recent research and theoretical

literature, and development of research designs for selected current issues. Prerequisite: Consent of instructor. 1 unit.

466. **Advanced Personality Theory.** Theoretical approaches to personality, emphasizing philosophical and theoretical issues rather than empirical research; considers broad conceptualizations of human behavior which emphasize the interdependency between various psychological levels of analysis (e.g., biological, social, developmental) and the social, economic, and political context in which the behavior occurs. Prerequisite: Psychology 307. 1 unit.
467. **Personality Assessment.** Methods and theory in the quantitative assessment of personality; review of research findings and trends. Prerequisite: Psychology 307 or equivalent. 1 unit.
468. **Contemporary Behavior Theory.** Analysis of contemporary issues in animal and human learning; specific topics vary. Prerequisite: Six units of graduate credit in psychology; consent of instructor. 1 unit.
469. **Cognitive Development.** Examination of laboratory investigations of cognitive development in children; emphasis on current theories of cognition and language; and class projects involving some laboratory work with children. Prerequisite: Twelve hours of psychology; consent of instructor. 1 unit.
470. **Principles and Methods of Teaching Psychology.** Designed for graduate students in psychology; areas considered include developing course objectives and content; developing and presenting teaching-learning situations; evaluating the attainment of course objectives; advising and counseling students; ethics in teaching; and research problems on the teaching of psychology. Prerequisite: Second-year graduate standing in psychology or consent of instructor. 1/2 or 1 unit.
483. **Psychology of Speech and Hearing Disorders, I.** Same as Speech and Hearing Science 483. See Speech and Hearing Science 483.
484. **Psychology of Speech and Hearing Disorders, II.** Same as Speech and Hearing Science 484. See Speech and Hearing Science 484.
485. **The Sampling of Human Populations and Social Organizations.** Same as Business Administration 435 and Sociology 485. See Business Administration 435.
486. **Multivariate Correlational Techniques in Educational Research.** Same as Educational Psychology 485. See Educational Psychology 485.
489. **Doctor of Psychology Report.** Limited to students pursuing the Psy.D. degree. Prerequisite: Credit or registration in Psychology 447. 0 to 4 units (summer session, 0 to 2 units). May be repeated.
490. **Individual Research.** For graduate students who wish to conduct research on special problems not included in graduate theses. Prerequisite: Consent of instructor. 0 to 4 units.
492. **Psychology of Learning and Instruction.** Same as Educational Psychology 492. See Educational Psychology 492.
493. **Seminar.** Discussion of current topics in their historical setting, with special emphasis on research problems. Prerequisite: Six units of graduate credit in psychology; consent of instructor. 0 to 1 unit.
494. **Multivariate Analysis in Psychology and Education.** Same as Educational Psychology 494 and Sociology 494. Examines the principal methods of descriptive and inferential statistics used in the analysis of multiple measurements, emphasizing linear transformations, multiple regression, principal components, multivariate analysis of variance, canonical correlation and variates, discriminant functions and variates, and conventional procedures of factor analysis; involves both theory and applications. Prerequisite: Psychology 307 or Educational Psychology 496; consent of instructor. 1 unit.
495. **Theories of Measurement.** Same as Educational Psychology 495. See Educational Psychology 495.
499. **Thesis Research.** 0 to 4 units

RADIO AND TELEVISION

Acting Head of Department: Professor J. W. Carey

Department Office: 119 Gregory Hall, 810 S. Wright, Urbana

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
252. **Television News Production.** Same as Journalism 252. See Journalism 252.
261. **Principles of Radio and Television Broadcasting.** An introductory course in the history of American radio and television broadcasting; comparative broadcasting systems; organization and operation of stations and networks; social and legal responsibilities of radio and television; codes and practices of broadcasting; and an introduction to radio and television audience measurement and survey methods. Prerequisite: Consent of the College of Communications. 3 hours.
267. **Radio News Production.** Same as Journalism 267. See Journalism 267.
291. **Special Problems.** Special projects, research, and independent reading in radio and television for students capable of individual work under the guidance of a faculty adviser. Prerequisite: Consent of department. 2 or 3 hours.
355. **Television News.** News coverage, script preparation, use of visual materials, and presentation of news programs; attention given to interviews, special events, and news fields of special interest. Prerequisite: Journalism 211; consent of department. 3 hours or 1/2 unit.
360. **Educational Uses of Television and Radio.** Same as Educational Psychology 360. Study of television and radio as educational instruments and standards necessary for such use; production, utilization, planning, and evaluation; primary and secondary uses; identification of the unique contributions and resources of the electronic media as well as their limitations; and experimentation in new production and utilization techniques designed for educational uses. 3 hours or 1/2 unit.
361. **Television Programs.** Television program history; types, structure, formats, and basic audience appeals; major emphasis on the creative aspects of originating and planning television programs. Prerequisite: Course or experience in television directing and production; consent of department. 3 hours or 1/2 unit.
362. **Radio and Television Station Management.** Study of the organization and administration of the radio and television staff and station; public relations, personnel management, and station operation; analysis of station and agency relationships, and radio and television sales procedures; methods and media for program and station promotion; and laws and regulations affecting management, financing, and labor relationships. Prerequisite: Radio and Television 261; senior standing; consent of department. 2 hours or 1/2 unit.
366. **Advanced Radio and Television Practices, I.** Project work for advanced students in selected areas of radio and television, including news, advertising, announcing, production and direction, and writing. Prerequisite: All courses in area of specialization; consent of department. 2 hours or 1/2 unit.
368. **Radio and Television Regulations.** Federal legislation, with emphasis on Communications Act of 1934 and the regulations of the Federal Communications Commission, legal problems in program operations, censorship and editorial selections, copyright, and author-producer relations. Prerequisite: Consent of department. 2 hours or 1/2 unit.
450. **Special Problems in Television.** Project work for advanced students in specific areas of television, including news, advertising, directing, writing, etc. Prerequisite: A television course in the area of specialization; consent of department. 1/2 to 3 units. A maximum of 3 units permitted toward degree.
462. **Seminar in Radio and Television.** Same as Communications 462. Study of the performance of radio and television in terms of content, government and industry controls, social responsibility, economic bases, and psychological and social effects. Prerequisite: Consent of department. 1 unit.
463. **World Broadcasting.** Same as Communications 463. Study of the broadcast systems used by the nations of the world; alternative and mixed systems; international

organizations, agreements, exchanges, and problems; broadcasts to and from other countries; implications of such new developments as satellites; and mass and nonmass uses. Prerequisite: Consent of department. 1 unit.

490. **Special Topics in Radio and Television.** Prerequisite: Consent of department. 1/2 or 1 unit.
499. **Thesis Research.** Prerequisite: Graduate standing in radio and television. 1 or 2 units

RELIGIOUS STUDIES

Director of Program: Professor D. L. Petersen

Office: 4016 Foreign Languages Building, 707 S. Mathews, Urbana

100. **Religions of Mankind: Unity and Diversity.** Examines the beliefs and rituals of the major religious traditions in Asia, Europe, and America under the following topics: what it means to be religious; myth, ritual, and reality; holy gods and profane world; religions and their founders; religious paths; holy types; traditions, modernity and change. 3 hours.
101. **The Bible as Literature.** Themes and literary genres in the Bible, emphasizing content important in Western culture. 3 hours.
102. **Religion and Science.** A study of changes brought about by the rise of modern science; focuses on historical conflicts (e.g., Copernicus and Darwin) and theological reflection regarding the significance of natural and social sciences for religious belief and practice. 3 hours.
104. **Asian Mythology.** Same as Asian Studies 104. An introductory survey of the mythologies of India, China, and Japan. 3 hours.
106. **Archaeology and the Bible.** Examination of archaeological evidence, especially from Syria-Palestine, and discussion of its use in the interpretation of Biblical literature. 3 hours.
110. **World Religions.** Same as Philosophy 110. See Philosophy 110.
111. **Elementary Koine Greek.** Same as Greek 111. See Greek 111.
112. **Elementary Koine Greek.** Same as Greek 112. See Greek 112.
120. **Judaism: An Introduction.** Conceptions of the Holy Man and of Holiness within the Judaic tradition: the man of God, the worldly scribe, and the philosopher-king; holiness within and outside society; holiness through the heart, the mind, and the law; holiness through study; and the holy land, the holy tradition, and the new holy man. 3 hours.
121. **Christianity: An Introduction.** Typological and historical approaches to major forms of Christianity: Eastern Orthodoxy, Catholicism, and Protestantism. 3 hours.
122. **History of East Asian Religions.** Same as Asian Studies 122. Introduction to East Asian religious traditions from classical to modern times; emphasizes the ideals of Confucianism, Taoism, Shinto, and Buddhism in China and Japan and their historical interactions. 3 hours.
125. **Religious Ethics.** Investigates the structure of ethical arguments in religious contexts; gives special attention to the influence of religious beliefs on the formulation of ethics; brings a variety of religious traditions into the discussion; and uses a number of contemporary issues to illustrate the various modes of argument. 3 hours.
130. **Jewish Practices: A Religio-historical Approach.** The major festivals and life-cycle rituals of Judaism; focuses on sacred time, interaction of external and internal factors producing change and conservatism, relationship of ritual and theology, and the thematic development inherent in the rituals. 3 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Intermediate Koine Greek.** Same as Greek 200. See Greek 200.
201. **Ancient Israel: History and Literature.** Survey of ancient Israelite history and religion, study of critical issues in the interpretation of Hebrew Bible literature, and the relation of Israel to the ancient Near Eastern cultural context. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
202. **Earliest Christianity: The New Testament Period.** Explication of traditions, concepts, metaphors, belief patterns, and literary forms in the New Testament by means of literary- critical study of the documents within the context of Jewish and Graeco-Roman culture. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
205. **Introduction to Classical Hebrew, I.** Same as Hebrew 205. See Hebrew 205.
206. **Introduction to Classical Hebrew, II.** Same as Hebrew 206. See Hebrew 206.
210. **Biblical Prose.** Same as Hebrew 210. See Hebrew 210.
221. **American Judaism.** Forms of Judaism in America: Reform, Conservative, Reconstructionist, Orthodox, and Hasidic Judaism; the American rabbi; Zionism in American Jewish communal life; national Jewish organizations; the American synagogue; and the secular Jew. 3 hours.
224. **Chinese Thought from Confucius to Mao.** Same as History 224. See History 224.
229. **Sociology of Religion.** Same as Sociology 229. See Sociology 229.
230. **Philosophy of Religion: Introduction.** Same as Philosophy 230. See Philosophy 230.
232. **Ancient Greek Sanctuaries.** Same as History of Art 218 and Classical Civilization 232. See Classical Civilization 232.
237. **Ancient Greek Religion.** Same as Classical Civilization 237. See Classical Civilization 237.
240. **Judaism in Antiquity: From Ezra to Destruction of the Second Temple.** Judaism from 586 B.C. to A.D. 70: Nehemiah; the Samaritans; Jewish Apocalyptic; Ben Sira; Philo; the Pharisees; the Dead Sea Sect; the Zealots; the Sicarii; the Sadducees; and Judaism and Hellenism. 3 hours.
241. **Judaism in Antiquity: The Rabbinic Period.** Judaism from the destruction of the Second Temple until the Moslem conquest: the religion of the ordinary folk; the synagogue; the literary products of the period; the social forms of rabbinic Judaism; and the theology of the rabbis. 3 hours.
242. **The Holocaust: Religious Responses.** The theoretical foundation for ideas of national and racial superiority which attended the holocaust and responses to this phenomenon by major Jewish and Christian thinkers, including Rubenstein, Buber, Fackenheim, Berkowitz, Reuther, and Wiesel. 3 hours.
284. **Jewish Experience in Literature.** Same as Comparative Literature and English 284. See English 284.
286. **Introduction to Hinduism.** Elements of Hindu thought and practice; selected topics presented in historical order and in the context of Indian cultural history (including the present). 3 hours.
288. **Chinese Religion: An Introduction.** Introduction to the Chinese religious traditions from classical to modern times; emphasis on the ideals of Confucianism, Taoism, and Buddhism, and their historical interactions; for students interested in gaining sympathy with Eastern faith. 3 hours.
290. **Independent Study.** Special topics not treated in regularly scheduled courses; designed primarily for upperclassmen. Prerequisite: Evidence of adequate preparation for such study; consent of staff member supervising the work. 2 to 6 hours. May be repeated.
293. **Honors Senior Thesis.** Two-semester research project. Prerequisite: Senior concentrators in religious studies who are eligible for graduating with distinction from the program. 3 hours. Must be taken for two semesters for a total of 6 hours.
294. **Topics in Religious Thought.** Topics in contemporary theological problems. 3 hours.

295. **Topics in Asian Religions.** Same as Asian Studies 295. Topics in Hinduism, Buddhism, Taoism, and other Asian religious traditions. Prerequisite: Sophomore standing or consent of instructor. 3 hours. May be repeated as topic varies to a maximum of 6 hours.
296. **Special Topics in the History of Judaism.** 3 hours. May be repeated for a maximum of 6 hours.
298. **Special Topics in Biblical Interpretation.** Detailed interpretation of selected books of the Bible. 3 hours.
301. **Introductory Coptic, I.** Same as Coptic 301 and Linguistics 314. See Coptic 301.
302. **Introductory Coptic, II.** Same as Coptic 302 and Linguistics 315. See Coptic 302.
304. **Medieval Civilization.** Same as History 304. See History 304.
305. **The Age of the Renaissance.** Same as History 305. See History 305.
306. **The Age of the Protestant and Catholic Reformation, 1500- 1648.** Same as History 306. See History 306.
307. **Islam and the Near and Middle East from Mohammed to 1258.** Same as History 307. See History 307.
311. **Hebrew Poetry.** Same as Hebrew 311. See Hebrew 311.
328. **Sociology of Asian Religions.** Same as Asian Studies and Sociology 328. See Sociology 328.
340. **The Formation of Christian Thought.** Study of major developments in early Christian thought (first four centuries) through discussion of primary texts in translation. Prerequisite: Religious Studies 201 and 202, or consent of instructor. 3 hours, or 3/4 or 1 unit.
341. **Martin Luther.** Same as German 341. See German 341.
361. **Comparative Religion.** Same as Philosophy 361. See Philosophy 361.
362. **Philosophy of Religion.** Same as Philosophy 324. See Philosophy 324.
363. **Religion in Anthropological Perspective.** Same as Anthropology 363. See Anthropology 363.
369. **Contemporary Religious Thought.** Same as Philosophy 363. See Philosophy 363.
371. **The Gospels.** Same as Greek 371. See Greek 371.
381. **American Intellectual and Cultural History to 1865.** Same as History 371. See History 371.
382. **American Intellectual and Cultural History since 1859.** Same as History 372. See History 372.
387. **History of Indian Buddhism.** The history of Buddhism in India from the Buddha to the Tantra, with emphasis on religious thought and practices. 3 hours, or 3/4 or 1 unit.
388. **History and Thought of Chinese Buddhism.** Survey of the history of Chinese Buddhism since its introduction; analysis of Buddhological trends and styles; and the sociocultural milieu of Chinese Buddhism and its place in the total history of ideas and lifestyles. Prerequisite: Religious Studies 288 or consent of instructor. 3 hours, or 3/4 or 1 unit.
389. **Religion and Society in Japan.** Historical analysis of the interrelationship between religion and society in Japan from ancient to recent times; Shinto, Confucianism, Buddhism, and the unique expressions of various periods in art, architecture, and literature; includes primitivism, aesthetics, syncretism, reformation, and modernization. 3 hours, or 3/4 or 1 unit.
484. **Narrative Semiotics.** Same as Comparative Literature, English and French 484. See French 484.
490. **Independent Study.** Special topics not treated in regularly scheduled courses; for graduates. Prerequisite: Evidence of adequate preparation for such study and consent of staff member supervising the work. 1/2 to 1 1/2 units. May be repeated

RHETORIC AND COMPOSITION

(See English)

ROMANCE LINGUISTICS

(See Spanish, Italian, and Portuguese)

RUMANIAN

(See Spanish, Italian, and Portuguese)

RURAL SOCIOLOGY

(See Agricultural Economics)

RUSSIAN

(See Slavic Languages and Literatures)

SAFETY EDUCATION

(See Health and Safety Education)

SANSKRIT

(See Asian Studies)

SCANDINAVIAN

(See Germanic Languages and Literatures)

SCULPTURE

(See Art and Design)

SECONDARY EDUCATION

Chairperson of Department: Professor C. B. Cox

Department Office: 395 Education Building, 1310 South Sixth, Champaign

- 101. Introduction to the Teaching of Secondary School Subjects.** A survey of recent developments in the teaching of secondary school subjects; assesses standard and new programs; and explores research and empirical evidence as they relate to effective teaching of secondary school subjects. Special sections are provided in the usual secondary school fields. Experiences in school settings, required in some curricula, are provided in Secondary Education 219. 2 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 209. Preliminary Field Experience in Secondary Teaching.** To be taken during the sophomore year by continuing students at the University of Illinois in secondary education curricula of English, mathematics, science, social studies, and speech. For students transferring into these programs at the 60 or near 60- hour level from other colleges, universities, or junior colleges, the course may be taken during the first semester of their work on this campus. Includes from 5 to 10 hours of visitation in public school classrooms, at least one microteaching lesson in the Teaching Techniques Laboratory, and one or more conferences with an advisor in teacher education. Students amass up to 10 hours of early field experiences toward the required total of 100 hours. 0 hours.
- 219. Field Experience in Secondary Teaching.** Offered in conjunction with Secondary Education 101 in the secondary teacher education program in English, mathematics, science, social studies, and speech. Meets in subject area discussion sections one hour per week throughout the semester for purposes of assignment to schools, orientation to specific field experiences, and monitoring and evaluating these experiences. Students are assigned in a school for at least two hours per week for the entire semester. Students amass at least 32 hours of early field experiences toward the required total of 100 hours. Prerequisite: Concurrent registration in Secondary Education 101. 0 to 2 hours.
- 229. Field Experience in Secondary Education.** Offered in conjunction with Secondary Education 240 for students in secondary teacher education programs adopting this means of fulfilling early field experience requirements. Meets in discussion sections paralleling Secondary Education 240 sections for one hour per week throughout the semester for purposes of assignment to schools, orientation to specific field experiences, and monitoring and evaluating these experiences. Students are assigned in school and community settings for at least two hours per week for the entire semester, thereby amassing at least 32 hours of early field experiences toward the required total of 100 hours. Registration is required in secondary teacher education programs adopting this means of fulfilling early field experiences requirements. Prerequisite: Concurrent registration in Secondary Education 240. 0 to 2 hours.
- 239. Microteaching: Practice in Teaching Techniques.** Instruction and practice in basic teaching techniques; consideration of both teacher-centered and learner-centered techniques; systematic examination of each technique in terms of basic descriptive and evaluative procedures; and application of techniques to specific instructional situations. Prerequisite: Junior standing. 2 hours.
- 240. Secondary Education in the United States.** Provides each specialized educational worker with a common orientation to the major responsibilities of the public school as a unit and to the educational worker's own specialized responsibilities and problems within the framework of the total educational enterprise. Experiences in school settings, required in some curricula, are provided in Secondary Education 229. Prerequisite: Secondary Education 101; Psychology 100; concurrent enrollment in Educational Policy Studies 201. 2 hours.
- 241. Techniques of Teaching in the Secondary Schools.** Same as Health Education 241. Methods of teaching specific subject matter fields in the secondary school; special sections provided in the usual high school subjects. Prerequisite: Educational

- Policy Studies 201; Secondary Education 240; concurrent registration in Educational Practice 242; consent of instructor. This course meets only during the first eight weeks of the semester. 3 to 5 hours.
247. **Teaching of Speech.** Same as Speech Communication 247. A study of methods and materials used in teaching speech in the high school. Prerequisite: Senior standing; 3.5 grade-point average. 3 hours.
249. **Independent Study.** Permits study of problems not considered in other courses; for students who excel in self-direction and intellectual curiosity. Prerequisite: Upperclassman; upper 5 percent of class in grade-point average; demonstrated writing competence, research potential, scholarly attitude, and interest as attested to by instructors; consent of adviser and staff member who supervises the work. 2 or 3 hours.
291. **Thesis.** Prerequisite: Senior standing. 2 hours.
292. **Thesis.** Prerequisite: Senior standing. 2 hours.
317. **Computer-Assisted Instruction.** Same as Computer Science 317. Computer-assisted instruction (CAI) and its relation to classroom teaching; the teacher's role in development, management, and criticism of CAI lessons; treatment of topics including instructional capabilities of CAI systems, instructional programming, and the design of CAI lessons. Prerequisite: Any computer science 100-level programming course, or consent of instructor. 4 hours or 1 unit.
336. **Fundamentals of Reading Techniques.** Same as Elementary and Early Childhood Education 336. See Elementary and Early Childhood Education 336.
338. **Teaching of Reading in Grades Four Through Twelve.** Developmental reading programs beyond the primary grades; factors related to reading speed and comprehension; vocabulary development, specific comprehension skills, study skills, and reading interests and tastes. Prerequisite: Elementary and Early Childhood Education 336 or Educational Psychology 211; junior standing. 3 hours, or 1/2 or 1 unit.
354. **Audio-Visual Communication.** Same as Elementary and Early Childhood Education 354. See Elementary and Early Childhood Education 354.
356. **The Computer and Mathematics Education.** Examines the role of the computer as an instructional tool in the secondary school mathematics classroom; reviews curricular materials and develops sample classroom projects in computer mathematics; analyzes computational problems and develops algorithms for their solution; and includes iteration, Monte Carlo methods, and simulation. Prerequisite: Computer Science 101 or 400, or consent of instructor. 4 hours or 1 unit.
399. **Issues and Developments in Secondary Education.** A seminar on topics not treated by regularly scheduled courses; requests for initiation may be made by students or faculty members. Prerequisite: Junior standing. 2 or 4 hours, or 1/2 or 1 unit. May be repeated to a maximum of 8 hours or 2 units.
433. **Clinical Supervision of Instruction.** Same as Administration, Higher, and Continuing Education 433. Designed for persons concerned with supervision of classroom instruction. Principally concerned with strategies for helping teachers realize their full professional potential; considers techniques of classroom observation, analysis of observations, and interaction skills; and uses video, audio, and printed protocols to develop observation and analytic skills, and role playing techniques to foster interaction skills. Prerequisite: Practice teaching. 1 unit.
435. **Interventions Used in Programs of Teacher Education.** Considers several teacher education programs, including conventional, humanistic, reinforcement, technical skills, and teacher competencies programs, in terms of selection and retention of candidates, professional preparation, general education and governance. Prerequisite: Satisfaction of college foundations requirements (Educational Psychology 311 and 312, and two 1/2 unit courses in social and philosophical foundations within Educational Policy Studies). 1 unit.
439. **Fundamentals of Curriculum Development.** Explores the several theoretical bases of curriculum planning and the implications of these approaches for practice. 1 unit.

- 441. Linguistic and Logical Analysis of Teaching.** An analysis of teaching from the standpoint of semantic and logical factors; discussion of topics such as theories of meaning, definition, explanation, and justification as employed by a teacher. 1 unit.
- 448. Continuing Education Program Development.** Same as Administration, Higher, and Continuing Education 448 and Vocational and Technical Education 448. See Administration, Higher, and Continuing Education 448.
- 449. Independent Study.** Offers opportunity and challenge of self-directive, independent study, that is, develops the individual's ability as an independent student and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department chairman prior to enrollment. 1/2 or 1 unit. No more than 2 units may be offered toward an advanced degree except by consent of the dean of the College of Education.
- 456. Problems and Trends in Specialized Fields of Secondary Education.** An intensive examination of problems and trends in the subject fields of the secondary school. Sections are usually offered in the following areas: English language and literature, mathematics, physical and biological sciences, social science, bilingual-bicultural education, physical education, and music. 1 unit.
- 483. Seminar in Literary Criticism and the Teaching of English.** Prerequisite: One year of graduate study of literature, or consent of instructor. 1 unit. May be repeated as topic varies.
- 490. Seminar for Advanced Students of Education.** Intensive examination of theoretical and policy issues in secondary education. Sections are usually offered in the following areas: curriculum policy and research, teacher education, English language and literature, mathematics, physical and biological sciences, social science, music, bilingual-bicultural education, and instructional applications of computers. Prerequisite: Admission to doctoral study in secondary education. 0 to 1 unit. May be repeated to a maximum of 2 units.
- 491. Field Study and Thesis Seminar.** Explores the identification and evaluation of research topics and problems in secondary education. Prerequisite: Admission to doctoral study. 1 to 2 units. May be repeated to a maximum of 2 units.
- 499. Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units

SERBO-CROATIAN

(See Slavic Languages and Literatures)

SLAVIC LANGUAGES AND LITERATURES

(Including Czech, Polish, Russian, Serbo-Croatian, Slavic, and Ukrainian)

Head of Department: Professor M. Friedberg

Department Office: 3092 Foreign Languages Building, 707 South Mathews, Urbana

Czech

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 383. The Structure of Modern Czech.** Analysis of the sound system and grammar of the contemporary Czech language with some reference to its historical development. Prerequisite: A knowledge of another Slavic language, preferably Russian, or consent of instructor. 3 hours or 3/4 unit.

- 384. Readings in Czech Literature.** Representative works of modern Czech literature and their historical and cultural background. Prerequisite: Czech 383 or consent of instructor. 3 hours or 3/4 unit

Polish

- 101. Elementary Polish, I.** Oral and written work on basic pronunciation, grammar, and vocabulary. For students with no work in Polish. 4 hours.
- 102. Elementary Polish, II.** Continuation of Polish 101. Prerequisite: Polish 101. 4 hours.
- 103. Intermediate Polish, I.** Grammar review, conversation practice, written exercises, and selected readings. Prerequisite: Polish 102 or equivalent. 4 hours.
- 104. Intermediate Polish, II.** Continuation of Polish 103. Prerequisite: Polish 103. 4 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 345. Polish Literature in Translation, I.** Same as Comparative Literature 335. A critical survey, in translation, of Polish literature from the Middle Ages to the end of the nineteenth century; special attention given to the works in their cultural context. 3 hours or 1 unit.
- 346. Polish Literature in Translation, II.** Same as Comparative Literature 336. A critical study, in translation, of modern Polish fiction, drama, poetry and essay, from Young Poland to the "New Wave"; their contribution to literary styles and genres in Poland and abroad; and special emphasis on Wyspianski, Witkiewicz, and Gombrowicz. 3 hours or 1 unit.
- 385. The Structure of Modern Polish.** Analysis of the sound system and grammar of the contemporary Polish language. Prerequisite: Knowledge of another Slavic language or consent of instructor. 3 hours or 3/4 unit.
- 386. Readings in Polish Literature.** Analysis of selected literary texts. Prerequisite: Polish 385 or consent of instructor. 3 hours or 3/4 unit

Russian

Courses taught in Russian are 211, 212, 213, 214, 215, 216, 303, 304, 313, and 314.

- 101. First-Year Russian.** Oral-aural practice and elements of grammar, reading, and writing. For students who have no credit in Russian. 4 hours.
- 102. First-Year Russian.** Continuation of Russian 101. Oral-aural practice and elements of grammar, reading, and writing. Prerequisite: Russian 101. 4 hours.
- 103. Second-Year Russian.** Oral-aural practice, systematic functional grammar, reading, and writing. Prerequisite: Russian 102 or equivalent. 4 hours.
- 104. Grammar Review and Conversation.** Systematic review of the structure of Russian covered in Russian 101-103 through class lectures, drills, and homework sheets; special attention paid to improving listening and speaking skills through class discussions and oral reports in Russian. Prerequisite: Russian 103. 4 hours.
- 114. Russian Civilization.** Survey of Russian civilization and culture with special emphasis on the people, national and social institutions, religion, and the arts (architecture, sculpture, painting, music, theatre, ballet). No knowledge of Russian required. 3 hours.
- 115. Russian Masterpieces in Translation, I.** Introduction to major works from the medieval period to 1880 in the context of Russian history and European literature. No knowledge of Russian required. 3 hours.
- 116. Russian Masterpieces in Translation, II.** Introduction to major works from 1880 to the present in the context of Russian history and European literature. No knowledge of Russian required. 3 hours.

191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
211. **Russian Conversation, I.** Conversational practice for the development of oral facility with emphasis on contemporary usage. Prerequisite: Russian 104 or consent of instructor. 3 hours.
212. **Russian Conversation, II.** Conversational practice for the development of oral facility with emphasis on contemporary usage. Prerequisite: Russian 211 or consent of instructor. 3 hours.
213. **Russian Composition, I.** Training in writing Russian; translation from English and free composition. Prerequisite: Russian 104 or consent of instructor. 3 hours.
214. **Russian Composition, II.** Training in writing Russian; translation from English and free composition. Prerequisite: Russian 213 or consent of instructor. 3 hours.
215. **Introduction to Russian Literature, I.** Reading and analysis of Russian literary texts; conducted in Russian. Prerequisite: Two years of college Russian or consent of instructor. 3 hours.
216. **Introduction to Russian Literature, II.** Reading and analysis of Russian literary texts; conducted in Russian. Prerequisite: Two years of college Russian or consent of instructor. 3 hours.
217. **Women in Russian Literature.** Same as Comparative Literature 217. The portrayal of women and issues of special concern to women in Russian literature of the nineteenth and the twentieth centuries; among subjects discussed will be the clash of traditional roles of women in Russian society with the aspirations engendered by secularization and modernization of Russia and progress in the education, changes in patriarchal family structure, the entry of women into the labor force and their formal political emancipation. 3 hours.
222. **Dostoevsky and Tolstoy.** Same as Comparative Literature 248. The art and thought of Russia's two greatest novelists; readings and discussion in English. 3 hours.
225. **Soviet Russian Literature.** Same as Comparative Literature 249. Major works since 1917, including Mayakovsky, Babel, Olesha, Bulgakov, Sholokhov, and others; readings and discussion in English. 3 hours.
270. **Parateaching.** Same as French, German, Latin, and Spanish 270. See French 270.
279. **Introduction to Foreign Language Education.** Same as French, German, Humanities, Latin, and Spanish 279. See Humanities 279.
280. **Teachers Course.** An introduction to the problems of the teaching of Russian and a study of textbooks. Prerequisite: Three years of college Russian or equivalent. 4 hours.
290. **Readings in Russian.** Individual topics or projects chosen in consultation with a Slavic Department representative. Prerequisite: Russian 104 or 105, or equivalent proficiency. 1 to 4 hours. May be repeated for a maximum of 8 hours.
293. **Honors Senior Thesis.** Intended primarily for candidates for honors in Russian but open to other seniors. Prerequisite: Senior standing. 2 hours. May be repeated.
303. **Advanced Reading and Conversation, I.** Conversation practice in Russian, based on reading materials from Russian literature and culture. Prerequisite: Three years of college-level Russian. 3 hours or 1/2 unit.
304. **Advanced Reading and Conversation, II.** Conversation practice in Russian, based on reading materials from Russian literature and culture. Prerequisite: Russian 303 or equivalent. 3 hours or 1/2 unit.
307. **Structure of Russian.** The morphology, syntax, and lexicon of modern Russian contrasted with English; attention to problems of teaching. Prerequisite: Russian 214 or consent of instructor. 3 hours or 3/4 unit.
308. **Russian Phonetics and Pronunciation.** Study of the Russian sound system; training in the improvement of pronunciation and intonation. Prerequisite: Russian 212 or consent of instructor. 3 hours or 3/4 unit.

310. **Theory and Practice of Translation.** Emphasis on general problems of translation and on specific difficulties associated with particular kinds of texts. Intensive translation practice. Prerequisite: Russian 214 or 216, or equivalent. 3 hours or 3/4 unit.
313. **Advanced Composition and Usage, I.** Practice in advanced composition and study of advanced problems of grammatical structure; emphasis on morphological categories in Russian grammar. Prerequisite: Three years of college Russian including Russian 214, or consent of instructor. 3 hours or 3/4 unit.
314. **Advanced Composition and Usage, II.** Further practice in advanced composition and study of advanced problems of grammatical structure; emphasis on syntax, usage, and style. Prerequisite: Russian 313 or consent of department. 3 hours or 3/4 unit.
315. **Nineteenth-Century Literature in Translation.** Same as Comparative Literature 337. A study of major Russian writers from Pushkin through Chekhov; no knowledge of Russian required. 3 hours or 3/4 unit.
317. **Twentieth-Century Literature in Translation.** Same as Comparative Literature 338. A study of major Russian writers from 1900 to the present; no knowledge of Russian required. 3 hours or 3/4 unit.
324. **Russian Modernism.** Same as Comparative Literature 357. Representative works of the period 1880 to 1917, with emphasis on Chekhov, Gorky, and Blok; readings for nonconcentrators and class discussions in English. Prerequisite: Junior standing or consent of instructor. 3 hours or 3/4 unit.
335. **Russian Drama.** Same as Comparative Literature 368. Historical survey of Russian dramatists and their works, from the origins in folk and liturgical playlets through classicism, Gogol, Ostrovsky, Chekhov, and Stanislavsky to Meierhold and the Soviet drama. Prerequisite: Junior standing or consent of instructor. 3 hours or 3/4 unit.
337. **Russian Poetry.** A study of significant Russian poets and their works from Zhukovsky through the twentieth century. Prerequisite: Russian 216 or equivalent. 3 hours or 3/4 unit.
360. **Studies in Russian Literature and Society.** Same as Comparative Literature 340. The role of Russian literature in the social, political, and intellectual life of Russia from the 1840s to the present. Prerequisite: Junior standing. 3 hours or 3/4 unit.
370. **Nabokov and the Emigre Literature.** Same as Comparative Literature 370. Twentieth-century non-Soviet Russian authors, including Nabokov, Bunin, Tsvetaeva, Z. Gippius, and Adamovich; no knowledge of Russian required. Prerequisite: Junior standing or consent of instructor. 3 hours or 3/4 unit.
375. **Russian Literary Translation.** Theory and practice of literary translation in Russia from the eighteenth century to the present; "literal" versus "creative" translation; and practical work in translation into English of various Russian literary texts. Prerequisite: Russian 214 or 216, or equivalent. 3 hours or 3/4 unit.
400. **Beginning Russian for Graduate Students.** Basic grammar and vocabulary; introduction to the reading of Russian texts in the sciences and the humanities. Designed for graduate students preparing to offer a reading knowledge of Russian for the Ph.D. 4 hours.
401. **Readings in Russian for Graduate Students.** Reading and translation of general and individually specialized materials, to increase speed, accuracy, and vocabulary; designed for graduate students preparing to offer a reading knowledge of Russian for the Ph.D. Prerequisite: Russian 400 or equivalent. 4 hours.
406. **Russian Morphology.** Survey of the various parts of speech of modern standard literary Russian with special emphasis on the nominal and verbal systems. 1 unit.
407. **Russian Syntax.** Survey of historical and contemporary Russian syntax. Prerequisite: Consent of instructor. 1 unit.
408. **Russian Phonology.** Same as Linguistics 408. The sound pattern of Russian in its synchronic and diachronic aspects. Prerequisite: Consent of instructor. 1 unit.
410. **Old Russian Literature.** Reading and analysis of texts with historical and literary commentary. Prerequisite: Slavic 405. 1 unit.

- 412. **Literature of the Eighteenth Century.** Reading of texts; historical and literary background of the period. 1 unit.
- 414. **Pushkin.** The age of Pushkin; Pushkin's works in historical and comparative perspective; textual criticism, linguistic and structural analysis, intellectual interpretation, and aesthetic evaluation. Prerequisite: Consent of instructor. 1 unit.
- 415. **Dostoevsky.** Same as Comparative Literature 415. Dostoevsky: historical background, textual analysis, structure, philosophy, artistic evaluation, and influence on French, English, American, and German literatures. 1 unit.
- 417. **History of the Russian Language.** Historical grammar, origin, and development of the literary language. Prerequisite: Slavic 405 or consent of instructor. 1 unit.
- 419. **Tolstoy.** Same as Comparative Literature 419. Tolstoy: historical background, textual analysis, structure, philosophy, aesthetic evaluation, and influence on French, English, American, and German literatures. 1 unit.
- 420. **Chekhov.** Same as Comparative Literature 420. Chekhov: historical background, textual criticism, structural analysis, philosophy, artistic evaluation, and interrelationship with English, French, German, Scandinavian, and American literatures. 1 unit.
- 421. **Seminar in the Russian Novel.** The nineteenth- and twentieth-century Russian novel; topics vary. Prerequisite: Consent of instructor. 1 unit. May be repeated for a maximum of 3 units.
- 423. **Seminar in Russian Poetry.** Pushkin, narrative verse, lyric verse, and symbolism. Prerequisite: Russian 337 or consent of instructor. 1 unit. May be repeated for a maximum of 3 units.
- 424. **Gogol.** Historical background, textual criticism, structural analysis, philosophy and ideology, and aesthetic evaluation. Prerequisite: Consent of instructor. 1 unit.
- 463. **College Teaching of Foreign Languages.** Same as English as a Second Language, French, German, and Spanish 463. See French 463.
- 481. **Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as English as a Second Language, French, German, and Spanish 481. See French 481

Serbo-Croatian

- 199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 392. **Structure of Modern Serbo-Croatian.** Analysis of the sound system and grammar of the contemporary Serbo-Croatian language. Prerequisite: Knowledge of another Slavic language or consent of department. 3 hours or 3/4 unit.
- 393. **Reading in Serbo-Croatian Literature.** Reading, analysis, and discussion of selected excerpts from Serbo-Croatian literature, scientific prose, and current press. Prerequisite: Serbo-Croatian 392 or consent of department. 3 hours or 3/4 unit

Slavic

- 199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 319. **Russian and East European Cinema.** Same as Communications and Speech Communication 319. Artistic, literary, and social aspects of cinema history, particularly Russian, Czech, Polish, and Yugoslavian. No reading knowledge of Russian is required, except for Department of Slavic Languages and Literatures concentrators. 3 hours or 3/4 unit.
- 380. **Introduction to Slavic Linguistics.** Same as Linguistics 380. The development of Common Slavic from Indo-European and its relationship to contemporary Slavic languages. Prerequisite: Reading knowledge of one Slavic language. 3 hours or 3/4 unit.

- 381. **Introduction to Study and Research in Slavic Languages and Literatures.** Introduction to methods and resources for study and research in Slavic languages, Russian literature, and Russian language teaching. 2 hours, or 1/4 or 1/2 unit.
- 382. **Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as a Second Language, French, German, Humanities, and Spanish 382, and Linguistics 386. See Humanities 382.
- 387. **Introduction to Myth and Folklore.** Same as Comparative Literature, English, German and Speech Communication 387. See English 387.
- 405. **Old Church Slavonic.** Analysis of grammar and reading of texts. Prerequisite: Slavic 380 or consent of instructor. 1 unit.
- 460. **Seminar in Slavic Linguistics.** Selected topics in the analysis of Slavic languages. Prerequisite: Slavic 380. 1 unit. May be repeated to a maximum of 3 units.
- 491. **Individual Topics.** Prerequisite: Graduate standing with a major or minor in Russian; consent of department. 1/4 to 2 units.
- 499. **Thesis Research.** 0 to 4 units

Ukrainian

- 118. **Ukrainian Literature in Translation.** Critical survey of major works in Ukrainian literature from the beginnings to the modern period in light of their historical and cultural background; lectures and readings in English. 3 hours.
- 199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 396. **The Structure of Ukrainian.** Ukrainian phonology, morphology, and syntax, presented against Russian as a background and basis for comparison of these two East Slavic languages. Prerequisite: Russian 104 or equivalent. 3 hours or 3/4 unit.
- 398. **Ukrainian Literature in Translation.** Critical survey of major works in Ukrainian literature from the beginnings to the modern period in light of their historical and cultural background; lectures and readings in English. 3 hours or 3/4 unit

SOCIAL SCIENCE

Director of School: Professor R. B. Crawford

School Office: 210 Lincoln Hall, 702 S. Wright, Urbana

- 145. **Introduction to Women's Studies in the Social Sciences.** Same as Sociology 145. The impact of culture and society on gender roles, including socialization and identity formation, as expressed in life-styles, marriage and family alternatives, and patterns of education and employment. 3 hours.
- 300. **Socio-Economic Management as Public Policy.** Same as Accountancy, Business Administration and Political Science 300. Examination of performance-oriented approaches to administration of public sector organizations; private sector accountability principles applied to governmental agencies; means of improving the performance of governmental agencies; corporate social responsibility; public policy implications of computer usage and individual privacy; and actual cases reviewed and discussed. Prerequisite: Consent of instructor. 3 hours or 1 unit.
- 499. **Thesis Research.** Prerequisite: Completion of 8 units of course work in the Master of Arts in the Social Sciences program and a passing grade on the comprehensive oral examination. 1/2 to 1 unit. May be repeated to a maximum of 2 units

SOCIAL SCIENCES, SCHOOL OF

(Please refer to individual alphabetical listings: Anthropology, Asian Studies, Geography, Latin American and Caribbean Studies, Political Science, Social Science, and Sociology.)

Director of School: Professor R. B. Crawford

School Office: 210 Lincoln Hall, 702 S. Wright, Urbana

SOCIAL WORK

Acting Dean of School: Professor F. Itzin

School Office: 1207 West Oregon Street, Urbana

100. **Contemporary Social Work.** A broad survey of the field of social welfare; introduction to social services, social welfare organizations, major social problems and target population groups, and the methods employed in service to individuals, groups, and communities; and includes the range of personnel and skills in social work agencies, and the means of education and training for social work. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
290. **Honors Seminar.** Lectures, student presentations, and discussions on selected topics in social work. Prerequisite: Twelve hours in social work courses; senior standing; 4.0 grade- point average in social work courses; and consent of instructor. 2 to 4 hours. May be repeated to a maximum of 4 hours.
298. **Practice Seminar.** Critical examination of the application of knowledge to social work practice; emphasis on reciprocal relationships between personal problems and needs, social environment, agency services, and helping methods; and consideration of new trends in practice and empirical knowledge. Prerequisite: Social work major; consent of undergraduate field instruction coordinator; concurrent registration in Social Work 299. 3 hours.
299. **Field Instruction.** The student is assigned to field instructors for learning experiences in social agencies and communities; experiences include the use of knowledge and understanding in analyses of case and problem situations and in direct service to agency clientele and communities. Prerequisite: Social work major; consent of undergraduate field instruction coordinator. 4 to 12 hours.
300. **Methods of Social Work Intervention, I.** Examination of the methods of social work intervention (casework, group work, and community organization) utilized in various social work agencies and social welfare settings; emphasis on understanding of the values, knowledge, principles, and processes of social work practice. Prerequisite: Admission to B.S.W. or M.S.W. program. 3 hours or 1 unit.
301. **Methods of Social Work Intervention, II.** An introduction to social work practice in groups, organizations, and communities; emphasizes understanding the values, principles, and processes of social work practice as well as developing skills for service delivery to groups, organizations, and communities. Prerequisite: Social Work 300; admission to B.S.W. or M.S.W. program. 3 hours or 1 unit.
303. **Delivery of Health Care: Problems and Perspectives.** Same as Health Education 303. The wide range of factors--ecological, social, cultural, medical, organizational, economic, and political--which influence health care in a complex nation like the United States; attention to perspectives from various fields of study. Prerequisite: Junior standing and consent of instructor. 3 hours or 1 unit.
310. **Social Welfare Policy and Services, I.** Critical study of the income maintenance system in the United States as a response to the problems of inequality of opportunity and income, poverty, and income security; consideration of alternative approaches with discussion of the social worker's role in the system. 3 hours or 1 unit.

311. **Social Services Policy and Services, II.** Critical evaluation of social policy and services in selected problem areas; includes the process of social policy analysis, current issues in funding and monitoring of personal social services, and strategies for dealing effectively with social problems. Prerequisite: Credit or concurrent registration in Social Work 310. 3 hours or 1 unit.
312. **Racial Minorities and Social Welfare.** Social welfare problems, history of self-help institutions, and development of formal social provisions in relation to racial minority groups and the minority status of individual clients; emphasizes indigenous change movements. Prerequisite: Admission to B.S.W. or M.S.W. program. 3 hours or 1 unit.
313. **Social Services for Health and Rehabilitation.** The psychological and sociological impact of illness and disability on the individual, the family, and the community, emphasizing the social worker's role in medical and rehabilitation settings. Prerequisite: Admission to B.S.W. or M.S.W. program, or consent of instructor. 3 hours or 1 unit.
314. **Social Services in Mental Health and Retardation.** Examination of comprehensive community mental health services as they evolve from definitions of the problems and changes in federal and state social policy; the concept of normalization and its criteria for program evaluation; and changing roles of mental health professionals, paraprofessionals, and consumers in policy making and service delivery. Prerequisite: Admission to B.S.W. or M.S.W. program, or consent of instructor. 3 hours or 1 unit.
315. **Social Work Services for the Aged.** The social needs of older people in the context of developing services and income transfer benefits; identifies major issues in social service delivery; and reviews methods of intervention on behalf of older people in terms of both skill required and policy implications. Prerequisite: Admission to B.S.W. or M.S.W. program, or consent of instructor. 3 hours or 1 unit.
316. **Social Services for Children and Families.** Child and family welfare policies and practice in relation to social services which support, supplement, or substitute for parental care of children; practice and policy issues in relation to the state's responsibility for guardianship, juvenile court, employment of children and young persons, and regulation of child-care facilities; and consideration of trends and issues in family and child welfare planning. Prerequisite: Admission to B.S.W. or M.S.W. program, or consent of instructor. 3 hours or 1 unit.
317. **Social Work and Corrections.** The problems of crime, characteristics of offenders, and components of the criminal justice system as a foundation for social work practice in correctional settings. Prerequisite: Admission to B.S.W. or M.S.W. program, or consent of instructor. 3 hours or 1 unit.
318. **Special Problems.** A small group seminar for independent study of a topic or topics of special interest in the field of social welfare; emphasis on examination and discussion of significant and current social welfare issues and problems. Prerequisite: Credit or concurrent registration in Social Work 300; consent of instructor. 3 hours or 1 unit.
319. **Social Work and the Public School.** Social work services in schools as a process in school-community-pupil relations; focuses on the school as a social system; and includes education as a continuum from preschool to adulthood, financing and other major problem areas, sociolegal issues which affect equality of education and pupil welfare, and some current educational innovations. Prerequisite: Graduate standing in social work or consent of instructor. 3 hours or 1 unit.
320. **Social Perspectives in Day Care.** Day care for children within a social context; day care institutions from the perspective of history, current issues, methods of operation, social work involvement, problems, and politics. Prerequisite: Admission to interdisciplinary day-care program or consent of instructor. 3 hours or 1 unit.
327. **Research Methods in Social Work Practice.** Objectives of research pertaining to social work practice; design of experiments; measurement and methods of collecting data; design of questionnaires and schedules; methods of data analysis including statistical hypothesis testing and applications of inferential techniques; interpretation

- of results; and preparation of reports. Prerequisite: An introductory course in statistics and admission to B.S.W. or M.S.W. program. 3 hours or 1 unit.
345. **Family Planning and Population Policy.** Same as Health Education and Sociology 345. Background information for professionals involved in the field of family planning; includes historical and current trends in developing and developed nations, with emphasis on the United States; and examines family planning and population policies, and programs and contraceptive methods as related to service delivery and to professional roles. Prerequisite: Six hours in the social sciences, or consent of instructor. 3 hours or 1 unit.
346. **Sexism: Social Service and Social Welfare.** Exploration and analysis of the effects of sexism on individual behavior and operations of societal institutions, especially as it affects professionals in their work with women; includes, emphasis on sex roles and human behavior, analysis of the psychological perspective on women, woman's place in the economic and political spheres with special emphasis on social work practice, social welfare laws and policies, minority women, and women as educators, students, counselors and clients. 3 hours or 1 unit.
351. **Human Behavior and Social Environment, I.** Current research and theory concerning the environmental influences on individual behavior; the family, small group, community, and social organization and the social and cultural causes and effects of discrimination. The social work practice context of each unit of content is a central focus. Prerequisite: Admission to B.S.W. or M.S.W. program and a course in human development. 3 hours or 1 unit.
400. **Comparative Analysis of Approaches to Casework.** Systematic and critical examination of selected approaches, conceptualizations, procedures, and techniques in casework theory and practice; includes the employment of a framework for the analysis and assessment of the various approaches, study of research related to process and outcome, and identification of practice issues. Prerequisite: Social Work 300. 1 unit.
401. **Comparative Approaches to Social Group Work Practice.** Social work practice theory in social group work through comparative study of various practice approaches; includes the utilization of the group work method in contemporary social work practice, practice principles, and the use of group process. Prerequisite: Social Work 300. 1 unit.
402. **Comparative Approaches in Community Organization Practice.** Principles and methods which characterize identifiable approaches used in community organization practice at neighborhood, community, state, and other levels. Prerequisite: Graduate standing in social work; Social Work 300 or consent of instructor. 1 unit.
404. **Seminar and Practicum in Clinical Group Work.** Exploration of concepts and issues related to integrity and encounter groups, self-help groups, and group psychotherapy; provides experience in an intensive encounter based on a structured, contractual integrity group; and emphasizes development of self-awareness, interpersonal skill, and leadership in facilitating clinical groups. Prerequisite: Social Work 401 or equivalent. 1 unit.
405. **Behavior Modification in Social Work.** Examination of conceptual ideas about behavior modification and their usefulness in working with clinical problems of concern to the social worker; focuses on intervention with individuals and families and the application of behavioral principles in working with groups, institutions, and communities; and emphasizes the development of a systematic approach for applying behavior modification principles in actual practice situations. Prerequisite: Social Work 300. 1 unit.
407. **Intervention Strategies for Institutional Change.** Generic social work strategies used for institutional change, emphasizing problems and issues in the public schools. Prerequisite: Social Work 319 or consent of instructor. 1 unit.
420. **Social Welfare Planning.** Examination of the interactional, interpersonal, and political aspects of social welfare planning in a variety of settings and under a number of auspices; formulation of models for social welfare planning. Prerequisite: Admission to M.S.W. program or consent of instructor. 1 unit.

- 421. Community Program Planning.** Definition of a problem of significant concern to a public social welfare agency; collection of data, gathering of opinions, and testing the feasibility of service options; and formulation of a program of service to ameliorate the problem. Prerequisite: Admission to M.S.W. program or consent of instructor. 1 unit.
- 426. Social Welfare Administration.** Principles and process of administration and management of social welfare organizations, including review of organization theory, policy formulation, agency structure and staff organization, and budgeting. Prerequisite: Admission to M.S.W. program or consent of instructor. 1 unit.
- 427. Service Accounting in Social Welfare.** Examines different types of services, to whom they are provided at what costs and with what results; within a systems perspective, considers methods of describing, reporting, and measuring client and target population characteristics, services, and resources; and includes allocation of scarce resources among competing demands and practice in specific methods. Prerequisite: Social Work 327 or equivalent. 1 unit.
- 428. Family Therapy Seminar and Practicum.** The principles, issues, and practices of family therapy; examines and compares major theoretical concepts; and enables students to learn how to do family therapy by studying theory and applying it in an actual practice experience. Prerequisite: Social Work 400 or consent of instructor. 1 unit.
- 431. Practice in Organizational Settings.** Critical analysis of social work practice: the agency's target population and clientele, task environment, structure, functions, task definitions, monitoring and planning mechanisms; methods of service delivery; ethical and legal considerations in service delivery; and the impact of racism, ethnocentrism, and sexism on social work practice. Prerequisite: Concurrent registration in Social Work 468. 1 unit.
- 432. Practice Evaluation.** Evaluation of social work practice: defining practice problems; operationalizing goals and objectives; developing hypotheses; designing evaluation plans to test hypotheses; describing interventions; collecting, analyzing, and interpreting data; and presenting results. Students complete an evaluation of some aspect of their own practice or their agency's program. Prerequisite: Social Work 431; concurrent registration in Social Work 469. 1 unit.
- 435. Supervision/Consultation/Staff Development.** The philosophy, objectives, principles, and methods of social work supervision, consultation, and training for staff development; analysis of similarities and differences in roles, knowledge, and skills required with emphasis on the teaching-learning-evaluating components; and issues arising from agency setting, changing legislation and program provisions, and relationships to social welfare administration. Prerequisite: Graduate standing in social work or consent of instructor. 1 unit.
- 452. Human Growth and Behavior and the Social Environment, II: Psychosocial Disorders.** Interrelationship of physical, emotional, learning, and social aspects of behavior disorders, and implications for the patient, family, and community; psychopathology, including neuroses, psychoses, character disorders, organic conditions, psychophysiologic disorders, and mental retardation; and diagnosis and treatment methods, including psychotherapy, somatic and drug therapies, and social work. Prerequisite: Social Work 351 or equivalent. 1 unit.
- 461. Special Studies in Social Work, I.** Independent or group study in areas of special interest; application of social work principles to special problems or settings. Prerequisite: Consent of instructor. 1/2 to 2 units.
- 462. Special Studies in Social Work, II.** Independent or group study in areas of special interest; application of social work principles to special problems or settings. Prerequisite: Consent of instructor. 1/2 to 2 units.
- 468. Field Instruction, II.** The student is assigned to field instructors for learning experiences in social agencies and communities. Such experiences include the use of knowledge and understanding in analyses of case and problem situations and in direct service to agency clientele. Prerequisite: Consent of instructor. 1 to 2 units.

- 469. Field Instruction, III.** The student is assigned to field instructors for learning experiences in social agencies and communities. Such experiences include the use of knowledge and understanding in analyses of case and problem situations and in direct service to agency clientele. Prerequisite: Social Work 468. 1 to 2 units.
- 484. National Social Welfare Policy.** Analyzes alternative concepts of social policy, the policy formulation process, and constraints on policy development in the United States; examines approaches to assessment of social policies. 1 unit.
- 485. National Social Welfare Policy, II.** Emphasis on the case approach within the context of basic political and governmental processes which influence the development, enactment, and application of national policy; analytical study of the background, legislative history, amendments, judicial interpretations, and operation of major national acts comprising our national social welfare policy, or bearing directly on social welfare such as the Social Security Act, the Employment Act, the Civil Rights Acts, and the Economic Opportunity Act. Prerequisite: Social Work 484 or consent of instructor. 1/2 to 2 units.
- 488. International Social Welfare.** Methodologies of comparative study; social welfare policies and programs in selected foreign countries; and special attention to foreign programs which provide data on American issues. Countries chosen vary. Prerequisite: Consent of instructor. 1 unit.
- 489. Social Work and the Law.** Legal procedures and issues of special relevance to social work practice; includes legal provisions related to poverty, family development and crises, racial and ethnic minorities, institutionalized persons, crime and delinquency, legal authority of social agencies, and regulation of the profession. Prerequisite: Graduate standing in social work or consent of instructor. 1 unit.
- 491. Research Seminar.** Seminar for students preparing research projects, either in groups or individually; experience in the application of research methods to current social work problems. Prerequisite: Social Work 327 or equivalent. 1 to 2 units.
- 492. Seminar on Models for Directed Change.** Same as Sociology 492. See Sociology 492.
- 493. Seminar: Design of Social Work Research.** Issues and problems in social work research; includes proof and verification, generalizability, and use of scaling and of judgments; and design of original research study. Prerequisite: Admission to Ph.D. program and Social Work 327, or consent of instructor. 1 unit.
- 497. Collective Bargaining in Public Employment.** Same as Labor and Industrial Relations 497, Administration, Higher, and Continuing Education 497, and Political Science 469. See Labor and Industrial Relations 497.
- 499. Thesis Research.** Research and writing of doctoral thesis. 0 to 4 units

SOCIOLOGY

Head of Department: Professor J. Huber

Department Office: 326 Lincoln Hall, 702 S. Wright, Urbana

- 100. Introduction to Sociology.** Examination of how societies grow and change; reciprocal effects of economic, political, community, familial, and scientific institutions on each other and on individual life changes; and social conflict, problems of bureaucratic growth and planned and unplanned social change. 3 hours.
- 131. Social Problems.** Origin of problems; consequences of ameliorative strategies. Typical topics include crime, mental illness, drug use, suicide, sexual behavior, violence, and intergroup conflict. 3 hours.
- 145. Introduction to Women's Studies in the Social Sciences.** Same as Social Science 145. See Social Science 145.
- 185. Introduction to Social Statistics.** Same as Geography 185. A first course in social statistics for students without mathematics beyond the high school level; topics include the role of statistics in social science inquiry, measures of central tendency

and dispersion, simple correlation techniques, contingency analysis, and introduction to statistical inference. Prerequisite: Sociology 100 or consent of instructor, or 6 hours in sociology, political science, anthropology, or geography. 3 hours.

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.

200. **Introduction to Sociological Theory.** Analysis of such classical theorists as Marx, Weber, Durkheim, and Mead and such contemporary theorists as Parsons, Merton, and Blau. 3 hours.

201. **Introduction to Social Psychology.** The social context of individual and interpersonal behavior. Observation, experimental and survey studies of: socialization; language acquisition and use; sources and changes of self concept; social interaction; emotions; coordination of interpersonal behavior; individual and interpersonal aggression, violence, and control; and adoption or rejection of innovations through social networks. 3 hours. Credit is not given for both Sociology 201 and Psychology 201.

202. **Sociology of Poverty and Wealth.** Analysis of social forces responsible for the persistence of gross income differences between the poor and the wealthy in affluent industrial societies, emphasizing institutional barriers to opportunity that affect women and various racial or ethnic groups. 3 hours.

206. **Political Sociology.** A study of power relations within and between the state, bureaucracy, community, social classes, and elites in the United States and other countries. 3 hours.

208. **Collective Political Violence.** The study of the causes, processes, and effects of collective violence, particularly of riots, coups, and revolution. 3 hours.

219. **Comparative Study of Societies.** Theories of the development and interdependence of social, economic, and political institutions; consequences of change. 3 hours.

222. **Introduction to Modern Africa.** Same as African Studies, Anthropology, and Political Science 222. See African Studies 222.

223. **Social Stratification.** Inequities in power, prestige, income, privilege, and lifestyles in the United States and other countries; class and status as determinants of group interests, ideologies, and interaction; and effects of social change and mobility. 3 hours.

224. **Sex Stratification in Industrial Societies.** Analysis of social institutions which perpetuate systematic discrimination by sex in industrial societies, with emphasis on occupations. 3 hours.

225. **Racial and Cultural Minorities.** A sociological and social- psychological analysis of minority groups; illustrative material drawn from representative racial, ethnic, and status groups. 3 hours.

229. **Sociology of Religion.** Same as Religious Studies 229. The functions of religious institutions in societies; religious leaders and leadership; religious groups in American society; and adaptations of religious institutions to modern needs and conditions. 3 hours.

231. **Juvenile Delinquency.** Historical change in definitions of delinquency, its causes and control; gangs; the juvenile justice system; treatment of offenders; and preventive programs. 3 hours.

235. **Comparative Social Stratification.** Role of social stratification, nature of social class, class determinants of culture, and class dynamics in comparative perspective; case studies of the United States, slave society, European and Japanese feudalism, Russia, India, China, and a nonliterate society. 3 hours.

240. **Crowds, Social Movements, and Violence.** Crowd formation and participation; recurring forms of individual and social behavior in crowds; routine and problematic crowd dispersal; social movement origins and participation; growth and organization; strategies, tactics, and consequences for participants and society; origins and consequences of racial, prison, sports and festival riots, and of violent confrontations between protest movements and the police. 3 hours.

246. **Vertebrate Social Organization.** Same as Anthropology, Ecology, Ethology, and Evolution and Psychology 246. See Ecology, Ethology, and Evolution 246.

249. **Sport and Modern Society.** Same as Physical Education 249. See Physical Education 249.
251. **Social Aspects of Mass Communications.** Same as Communications and Journalism 251. See Journalism 251.
259. **Organizations.** Conflict, communication, coordination, and leadership in the bureaucracies that characterize modern society; relations of individuals, organizations, and society; how organizations are intended to work and how they do work, emphasizing business firms, unions, schools, public agencies, hospitals, and prisons. 3 hours. Credit is not given for both Sociology 259 and 322.
260. **Work and Occupations.** The meaning of work and leisure in modern society; job satisfaction, alienation, and the work ethic; occupational conflicts over money, status, and authority; impact of occupational segregation by sex and race on earnings, unemployment, and politics; job and career mobility; and improvement of work life and leisure. 3 hours.
263. **Inequality and Power in Contemporary China.** Same as Asian Studies 263. Introduction to patterns of social inequality in the People's Republic of China; the social contexts of the Chinese approach to poverty, education, health care, bureaucracy, urbanization, the environment, sex and ethnic discrimination, and law and order, with comparisons to other societies. 3 hours.
264. **Introduction to Medical Sociology.** The sociology of health and illness behavior and the social structure of systems which deliver health care services; includes social constraints on illness, the illness role, medical organizations and professions, and the application of the illness model to deviant forms of behavior. 3 hours.
270. **Population Issues.** Same as Rural Sociology 270. Examines the current world population situation; the historical and current patterns of birth, death, migration, marriage, contraception, and abortion; and the world food and energy resources, crowding, and problems of overpopulation. 3 hours.
275. **Community.** Structure and function of communities in mass society; ecological and social psychological perspectives; social networks; ethnographic case studies of small towns and neighborhoods; and community types. 3 hours.
276. **Cities and Suburbs.** Metropolitan communities in modern society; neighborhoods, suburbs, ghettos, and slums as subcommunities; demographic, ecological, and technological aspects of urban change; and urban social networks. 3 hours.
277. **Rural Social Change.** Same as Rural Sociology 277. See Rural Sociology 277.
281. **Survey Research.** Principles and applications of social science survey research methods; class project designing and conducting a sample survey; training and experience in analysis of survey data; sampling, questionnaire construction, interviewing and data reduction, and file management; and direct use of the computer in survey data analysis. Prerequisite: Sociology 185 or equivalent. 3 hours.
290. **Individual Study.** Individual study or research project. Prerequisite: Six hours of sociology; written consent of instructor on form available in 326 Lincoln Hall. 1 to 6 hours. May be repeated.
291. **Honors Individual Study.** Prerequisite: Open only to seniors in the sociology field of concentration who are eligible for departmental distinction; written consent of instructor on form available in 326 Lincoln Hall. 3 hours.
293. **Honors Senior Thesis.** Open only to seniors in the sociology field of concentration who are eligible for departmental distinction. Prerequisite: Sociology 291 and written consent of instructor on form available in 342 Lincoln Hall. 3 hours.
296. **Special Topics.** Prerequisite: Sociology 100 and consent of instructor. 3 hours. May be repeated as topics vary.
310. **Knowledge, Science, and Society.** The social conditions and consequences of political, religious, aesthetic, and scientific forms of knowledge. Prerequisite: Sociology 100 or six hours of social science. 3 hours, or 1/2 or 1 unit.
315. **Sociology of Education.** Same as Educational Policy Studies 315. See Educational Policy Studies 315.
316. **Sociology of Adolescence.** Effects of social class, ethnic and minority status of modern adolescence; problems such as sex, identity, generational conflict, academic

- and social failure, and delinquency; effects of family, education, peer culture, politics, religion, welfare, work, and leisure. Prerequisite: Sociology 100 or 6 hours of anthropology, geography, political science, or sociology. 3 hours, or 1/2 or 1 unit.
317. **Sociology of Law.** Social origins and consequences of law and legal process, emphasizing problems of legal change and structure and function of legal sanctions. Law and law-like phenomena in primitive and modern societies. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or 1/2 or 1 unit.
318. **Work in Industrial Society.** Same as Labor and Industrial Relations 318. Selected problems in industrialization and technological change, labor force, meanings of work, the factory as a work place, corporate organization and corporate society, and alienation and authority. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or 1/2 or 1 unit.
320. **Social Roles.** Contemporary role theory and related concepts such as social status and social interaction; age, sex, vocational, social class, and other role types; applications of this theory to the study of the socialization process and personal adjustment; and the analysis of critical group situations and social change. Prerequisite: Sociology 100, or 6 hours of anthropology, geography, political science, or sociology. 3 hours, or 1/2 or 1 unit.
321. **Family and Kinship in Industrialized Societies.** Mate selection, marriage and consensual unions, separation and divorce, interaction and authority patterns, family crisis and social change. Prerequisite: Sociology 100, or 6 hours of anthropology, geography, political science, or sociology. 3 hours, or 1/2 or 1 unit.
322. **Complex Organizations.** How large business, industrial, governmental, military, and other organizations innovate, resist change, and interact with one another; problems of measuring organizational performance. Prerequisite: Sociology 100, or 6 hours of anthropology, geography, political science, or sociology. 3 hours or 1 unit. Credit is not given for both Sociology 259 and 322.
323. **The Small Social Group.** Theory, observation, and analysis of face-to-face social groups, such as friendships, cliques, clubs, committees, and experimental groups; characteristics, functions and forms of small group interaction. Prerequisite: Sociology 100, or 6 hours of anthropology, geography, political science, or sociology. 3 hours, or 1/2 or 1 unit.
324. **Penology.** History of punishment and treatment of offenders; social organization of prison life, male and female inmate cultures, prison race relations, and violence; reform, parole, community correctional facilities, and effectiveness of treatment. Prerequisite: Sociology 100, or 6 hours of anthropology, geography, political science, or sociology. 3 hours, or 1/2 or 1 unit.
325. **The Philosophy of Social Science.** Same as Anthropology 329 and Philosophy 375. See Philosophy 375.
326. **Social Mobility and Class Structure.** Patterns, causes, and consequences of social mobility and immobility; analysis of rising and falling classes in industrial and developing countries; circulation of political, social, and economic elites; institutional sources of individual mobility. Prerequisite: Sociology 100, or 6 hours of anthropology, geography, political science, or sociology. 3 hours, or 1/2 or 1 unit.
327. **Japanese Society.** Same as Asian Studies 303. The institutions of contemporary Japan and their historical roots; the Japanese approach to modernization and development and social change; and implications of the Japanese experience for applied social change in developing areas and for social science theory and methodology. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science or sociology. 3 hours or 1 unit.
328. **Sociology of Asian Religions.** Same as Asian Studies and Religious Studies 328. A comparative study of the influences of religion on the societies of Asia, and vice-versa; focus on the problems of social change and development; and concentration on the religions and social systems of Iran, India, Thailand, China, and Japan. Prerequisite: Sociology 100, or 6 hours of anthropology, geography, political science, or sociology. 3 hours, or 1/2 or 1 unit.

329. **Comparative Family Institutions.** Cross-cultural analysis of family institutions, with special reference to vital and demographic backgrounds; stress on property, authority, and the handling of deviance, and relationship to religion, economy, and polity. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or 1/2 or 1 unit.
330. **Comparative Political Sociology.** Same as Political Science 330. Examines sociological theories of politics; analyzes forces that maintain societies or produce social, political, and economic change. Prerequisite: Sociology 100 or Political Science 150; or 6 hours of anthropology, geography, political science, or sociology. 3 hours or 1 unit.
331. **Criminology.** Nature and extent of crime; past and present theories of crime causation; criminal behavior in the United States and its relation to personal, structural, and cultural conditions. Prerequisite: Sociology 100, or 6 hours of anthropology, geography, political science, or sociology. 3 hours, or 1/2 or 1 unit.
332. **Research Methods in Social Psychology: Laboratory Methods.** Same as Psychology 332. See Psychology 332.
333. **Sociology of Mental Illness.** Mental health issues from organizational, demographic, and social-psychological perspectives; emphasizes the sociological implications of mental problems, the organization of treatment and confinement, and the role of the therapist. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or 1/2 or 1 unit.
337. **Social Causes of Health and Illness.** Examines social correlates of illness (e.g., heart disease, cancer, obesity, alcoholism), methods of social epidemiology, stressors in the social environment, and factors that lessen the impact of stress. Prerequisite: Sociology 264; or 6 hours of anthropology, health and safety education, psychology, or sociology. 3 hours, or 1/2 or 1 unit.
338. **Sociology of Health Care.** Discusses the relationship of lifestyles and health; reasons for variations in patient recognition and acceptance of disease and its treatment (e.g., for chronic, terminal, or debilitating disease); variations in seeking health care; the patient-provider relationship; and coping with aging and death. Prerequisite: Sociology 264. 3 hours, or 1/2 or 1 unit.
339. **The Organization of Health Care.** Examines becoming a health professional, relationships among health workers, health care organizations (e.g., doctor's offices, clinics, hospitals, and nursing homes), networks of health services, evaluation of health care, and social policy issues. Prerequisite: Sociology 264; or 6 hours of anthropology, health and safety education, psychology, or sociology. 3 hours, or 1/2 or 1 unit.
340. **Social Movements.** Origins and development of groups in promoting and resisting change, resource mobilization, strategies and tactics, individual and social consequences. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or 1/2 or 1 unit.
343. **Social Change in Developing Areas.** Same as Rural Sociology 343. See Rural Sociology 343.
345. **Family Planning and Population Policy.** Same as Health Education and Social Work 345. See Social Work 345.
350. **Soviet Social Institutions.** Structural consequences of Communist ideology and industrialism, social stratification and mobility, nationalities, family and education communications and public opinion, and socialized medicine. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or 1/2 or 1 unit.
352. **Attitude Theory and Change.** Same as Communications 352 and Psychology 352. See Psychology 352.
355. **Chinese Society.** Same as Asian Studies 355. Social, cultural, and demographic heritage of and western impact on an ancient civilization; processes of planned and unplanned change; peasant land economy, family, social stratification, and mobility. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or 1/2 or 1 unit.

356. **Economics of Population and Resources.** Same as Economics 356. See Economics 356.
358. **Politics of Crime and the Criminal Process.** Same as Political Science 358. See Political Science 358.
359. **The Social Psychology of Organization.** Same as Psychology 359. See Psychology 359.
364. **Population Trends and Patterns.** Introduction to contemporary demographic patterns and their historical development; transition theory and other models of demographic change; components of population growth and distribution; and trends and differentials in mortality and fertility. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours or 1 unit.
371. **Comparative Social Institutions.** Structural systems such as family, kinship, occupations, political institutions, social stratification and mobility, using materials from less-developed and advanced industrial societies; consequences of different institutional systems on modernization and development. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or 1/2 or 1 unit.
373. **Latin American Social Institutions.** Class structures, family, kinships, religious, economic, and political institutions; trends in urbanization, ecological organization, and population. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or 1/2 or 1 unit.
380. **Methods of Field Research.** Instruction, training, and supervised practice in methods of field research as a basic tool of sociology; emphasis on the role of the field researcher as participant, observer, and interviewer in various kinds of research settings, and on approaches to and applications of field data. Prerequisite: Sociology 100 and 185. 3 hours, or 1/2 or 1 unit.
385. **Social Statistics, I.** Introduces statistical methods as applied to sociology and other social sciences: probability concepts, binomial and normal distributions; statistical inference, t-test and F-test, bivariate correlation and regression, multiple regression, dummy variables and analysis of variance, contingency tables; reliability and simple index construction; types of sampling and their effects on analysis. Applies statistical computing packages (e.g., SPSS) to social science data. Prerequisite: Sociology 185, or Mathematics 111 or 112; or equivalent. 3 hours or 1 unit. Students may not receive credit for Sociology 385 if they have received credit for any one of the following: Mathematics 161, 263, 362, 363, or 364; Psychology 233, 234, or 235; Economics 171 and 172; Agronomy 340; Educational Psychology 390; Biology 371, 372, or 373; Forestry 321; Social Work 327.
386. **Social Statistics, II.** Examines social science applications of the general linear model and its extensions; topics include: model specification; ordinary and generalized least squares; multicollinearity; selection of predictors; interaction of variables and non-linear regression; panel and time-series data; measurement error; path analysis; recursive and non-recursive structural equation models. Applies statistical computing packages (e.g., SPSS) to social science data. Prerequisite: Sociology 385 or equivalent. 3 hours or 1 unit. Students may not receive credit for both Psychology 306 and Sociology 386.
387. **Social Statistics, III.** Examines social science applications of discrete and continuous multivariate analysis; topics include: analysis of categorical data (loglinear modelling, probit analysis, etc); geometric interpretation of matrices; factor analysis and index construction; canonical analysis; discriminant analysis; unobserved variables and structural equation models; issues in model specification and estimation. Applies statistical computing programs such as ECTA and LISREL to social science data. Prerequisite: Sociology 386 or equivalent. 3 hours or 1 unit. Students may not receive credit for both Psychology 307 and Sociology 387.
388. **Basic Methods of Demographic Analysis.** Introduction to statistical and mathematical procedures in population analysis; the gathering, processing, and evaluating of registration and census data; the life table model; and procedures of

- mortality and fertility analysis and population projections. Prerequisite: Mathematics 111 or 112, or equivalent. 3 hours or 1 unit.
396. **Special Topics.** Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours or 1 unit. May be repeated as topics vary.
400. **Classical Sociological Theory.** Analysis of major classical sociological theorists of the nineteenth and early twentieth centuries, stressing the social, historical, and philosophic foundations of sociological theory; primary emphasis on Marx, Durkheim, and Weber. Prerequisite: Sociology 200 or equivalent. 1 unit.
401. **Contemporary Sociological Theory.** Major theorists and schools of thought since World War I with emphasis on the contemporary period; includes functionalism, exchange theory, conflict theory, symbolic interaction, and phenomenology. Prerequisite: Sociology 400 or equivalent. 1 unit.
402. **Social Stratification.** Theory and data concerning structured social inequality in industrialized societies, with special focus on the United States. 1 unit.
405. **European Sociology: Recent Developments.** Reviews the major sociological centers in France, Germany, Great Britain, Poland, Russia, and Scandinavia, emphasizing special problems selected on the basis of their theoretical importance. Prerequisite: Two graduate-level courses in social science. 1/2 or 1 unit.
406. **Psychological Scaling: Unidimensional Methods.** Same as Psychology 406. See Psychology 406.
407. **Techniques in Demographic Analysis.** Same as Rural Sociology 407. The analysis of family formation and dissolution; measures of population movement and distribution; and introduction to the stable population model and to applications in the estimation of demographic measures. Prerequisite: Sociology 388. 1 unit.
408. **The Sociology of Human Fertility.** Comparative studies of levels of fertility in different societies and in the same societies at different times; analysis of sociological, psychological, and demographic factors affecting human reproduction and family planning, and consequences of differentials in fertility. Prerequisite: Graduate standing or consent of instructor. 1 unit.
409. **Psychological Scaling: Multidimensional Methods.** Same as Psychology 409. See Psychology 409.
410. **Crowd Behavior.** An examination of classic and contemporary theory and research bearing on crowd formation, form, relocation, and dispersal; the production, maintenance, and alteration of various behaviors within crowds; and emphasis on direct observation of, and the design of field and laboratory research bearing on these phenomena. 1 unit.
412. **Demography of Human Mortality.** Historical trends and patterns in human mortality and their social implications; international differentials in mortality levels and cause-of-death patterns; the measurement of mortality; age, sex, ethnic, marital, and socioeconomic mortality patterns; and some consequences of mortality declines. Prerequisite: Sociology 270 or 364, and Sociology 388. 1 unit.
414. **Seminar on Social Interaction.** Same as Communications 414. An analysis of social interaction based on the social psychology of C. H. Cooley, G. H. Mead, and W. I. Thomas; presentation of problems of theory, concepts, and method. Prerequisite: One unit of graduate credit in sociology. 1 unit.
415. **Survey Research Methods, I.** A laboratory course in survey research methods to provide students with advanced training and experience in survey design, data collection, and quality control; students and staff design and collect data for a sample survey on a specific topic which varies year to year. Three to ten hours of laboratory time per week. 1 unit.
416. **Survey Research Methods, II.** A laboratory course in survey research methods to provide students with advanced training and experience in problem formulation and computerized data analysis using statistical packages, e.g. SPSS; under staff guidance, a student will select a topic and write a professional-level paper using data collected in Sociology 415. Three to ten hours of laboratory time per week. 1 unit.

417. **Seminar in the Sociology of Law.** Selected areas of theory and research (varying from year to year); possible topics include civil litigation and the civil courts, police operations and the sociology of law and order, sociological theories of justice, and the operations of legal agencies. Prerequisite: Sociology 317. 1 unit.
418. **Seminar in Industrial and Economic Sociology.** Same as Labor and Industrial Relations 418. See Labor and Industrial Relations 418.
421. **Seminar on Research in Marriage and Family Life.** Relationships between research methods and concepts used to study family life as illustrated by studies focusing on family interaction and the nature of the family unit. Prerequisite: Consent of instructor. 1 unit.
422. **Theory of Social Groups.** A survey of selected conceptual systems used to analyze human groups to determine the origins and referents of the concepts, their interrelations, and their utility as sources of testable generalizations relevant to the solution of empirical problems in group analysis. 1 unit.
424. **Sociology of Human Service Delivery Systems.** Intensive analysis of service delivery systems; focuses on delivery of health-care, educational, mental health, welfare, rehabilitation, and/or correctional services; and includes structure, access, quality, innovation, and modelling of the systems. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
425. **Racial and Cultural Minorities.** Study of the factual and conceptual aspects of minority status as determined by racial and cultural criteria. Prerequisite: Undergraduate major or minor in sociology or anthropology. 1 unit.
429. **Seminar in the Sociology of Religion.** Theoretical and sociological significance of research on religious groups and institutions; evaluation of research methods. Prerequisite: Sociology 400. 1 unit.
432. **Special Problems in Theory and Research on Deviant Behavior.** A seminar concerned with the critique of recent theory and research on selected problems in the study of delinquency, crime, mental disorder, and the collaborative development of new theory and research designs. Prerequisite: Sociology 331 or consent of instructor. 1 unit.
433. **Sociometrics, I.** Advanced application of statistical methods to sociology and sociological models, with emphasis on cross-sectional applications; includes theory of probability and statistical inference, the construction of stochastic sociological models, the general linear single-equation model (regression analysis, analysis of variance, covariance analysis, discriminant analysis), the covariance-structure multinormal model, and linear and log-linear models for discrete data. Prerequisite: Sociology 387, six hours of calculus and three hours of linear or matrix algebra, or consent of instructor. 1 unit.
434. **Sociometrics, II.** Continuation of Sociology 433. Extensions of the general linear single-equation model, the covariance-structure multinormal model, and the log-linear model for discrete data to models of several relations in sociology; specification, identification, parameter estimation, and hypothesis testing for simultaneous-equation (recursive and nonrecursive) sociological models; incorporation of measurement error in sociological data; and specification and aggregation analysis. Prerequisite: Sociology 433 or consent of instructor. 1 unit.
440. **Political Sociology.** The impact of social cleavages and cohesion on political institutions and movements; theories of conflict and power; composition and behavior of power elites; participation in political associations; national and local power structure; functions of electoral behavior; national and mass political movements. Prerequisite: A course in sociological theory or consent of instructor. 1 unit.
444. **Seminar in Public Opinion.** Same as Communications 444. Development and theory of public opinion process in society; censorship, interest groups, and propaganda; and mass media and public opinion. 1 unit.
445. **Sociology of Leisure.** Same as Leisure Studies 445. See Leisure Studies 445.
449. **The Sociology of Sport.** Same as Physical Education 449. See Physical Education 449.

- 450. Problems of Soviet Society in Transition.** Major problems of directed social change from an agricultural to an industrial system under a Soviet-type totalitarian regime; phases of the revolutionary process, inconsistencies between ideology and industrial demands, unanticipated consequences of social change, the simultaneous impact of industrialism and totalitarianism, and implications of the Soviet experience for other countries. Prerequisite: Consent of instructor. 1 unit.
- 456. Organizational Sciences, I.** Same as Business Administration 410, Political Science 460, and Psychology 453. See Business Administration 410.
- 474. Survey Methods in Marketing Research.** Same as Business Administration 431. See Business Administration 431.
- 475. Seminar in Demography.** In-depth analysis of a selected area in population studies; topics include population theory, population policy, urbanization, migration, the labor force, ethnic demography, demography of the family, mathematical demography, historical demography, and regional studies. See Timetable for current topics. Prerequisite: Sociology 270 or 364, Sociology 388, and consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 476. Urban Communities and Urbanization.** Intensive study of special aspects of the urbanization process as it affects the life of communities in this and in other countries. 1 unit.
- 477. Seminar on Community Organization.** Same as Rural Sociology 477. Theories relating to the community concept and the analysis of community organization; the process of community change as applied to societies in various parts of the world. Prerequisite: Sociology 275 or consent of instructor. 1 unit.
- 482. Recent Developments in Sociology.** Intensive study of selected topics based on contemporary works of major importance in the development of sociological theory. 1 unit. May be repeated for a total of 2 units.
- 485. The Sampling of Human Populations and Social Organizations.** Same as Business Administration 435 and Psychology 485. See Business Administration 435.
- 487. Special Problems in Rural Sociology.** Same as Rural Sociology 487. See Rural Sociology 487.
- 490. Individual Topics in Sociology.** Supervised individual investigation or study of a topic not covered by regular courses; topic selected by the student and the proposed plan of study must be approved by the adviser and the staff member who supervises the work. 1/2 to 2 units.
- 492. Seminar on Models for Directed Change.** Same as Social Work 492. Construction and analysis of models for planned intervention at the personal, small group, and community levels; construction of models as interpretations of behavioral science theory; extrapolation of hypotheses and of guides to intervention from the models; and reading from several disciplines as relevant. Prerequisite: Consent of instructor. 1/2 to 1 unit.
- 494. Multivariate Analysis in Psychology and Education.** Same as Educational Psychology and Psychology 494. See Psychology 494.
- 495. Advanced Topics in Quantitative Sociology.** Intensive study of selected topics in mathematical sociology and social statistics; development of mathematically formulated sociological theories in such topics as social networks, social mobility and stratification, population dynamics, and collective decisions; and development and application of statistical methods for the empirical analysis of sociological models. Prerequisites may vary according to the current topic. Prerequisite: Consent of instructor. 1 unit.
- 499. Thesis Research.** 0 to 4 units

SPANISH, ITALIAN, AND PORTUGUESE

(Including Catalan, Romance Linguistics, and Rumanian)

Chairperson of Department: Professor Spurgeon Baldwin

Department Office: 4080 Foreign Languages Building, 707 South Mathews Avenue, Urbana

Catalan

301. **Studies in Catalan Language.** An introductory study of the Catalan language. Prerequisite: Eight hours of Latin or any Romance language. 2 hours or 1/2 unit

Italian

101. **Elementary Italian.** For students who have no credit in Italian. All students in this course are required to attend two twenty-minute laboratory sessions per week in the language laboratory. 4 hours.
102. **Elementary Italian.** Continuation of Italian 101. All students in this course are required to attend two twenty-minute laboratory sessions per week in the language laboratory. Prerequisite: Italian 101 or one year of high school Italian. 4 hours.
103. **Intermediate Italian.** Rapid reading, review of grammar, composition, and conversation. All students in this course are required to attend two twenty-minute laboratory sessions per week in the language laboratory. Prerequisite: Italian 102 or two years of high school Italian. 4 hours.
104. **Intermediate Italian.** Continuation of Italian 103. Prerequisite: Italian 103 or three years of high school Italian. 4 hours.
105. **Intensive Beginning Italian.** Equivalent to Italian 101 and 102; for students with no prior Italian credit who wish to learn at a rapid rate; speaking, reading, writing and aural comprehension. Students are encouraged to attend the language laboratory and/or use the recorded tapes through the Community Access Telephone System. 8 hours. Students may not receive credit for Italian 105 and 101, 102, or equivalent.
130. **Italian Medieval Literature and Civilization.** Same as Comparative Literature 130. The development of Medieval Italian civilization in a literary context from the Sicilian School of love poetry to the early Renaissance in Florence; lectures and readings are in English. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
209. **Italian Syntax and Phonetics.** Italian composition and conversation; syntax and phonetics. Prerequisite: Italian 104 or consent of instructor. 3 hours.
211. **Composition and Conversation, I.** Training in oral-aural skill and in writing; practice in the language laboratory required. Prerequisite: Italian 209 or consent of instructor. 3 hours.
212. **Composition and Conversation, II.** Continuation of Italian 211. Prerequisite: Italian 211 or consent of instructor. 3 hours.
221. **Introduction to Italian Literature, I.** Introduction to representative works and movements of Italian literature since the Renaissance. Prerequisite: Italian 104 or consent of instructor. 3 hours.
222. **Introduction to Italian Literature, II.** Introduction to representative works and movements of Italian literature in the Middle Ages and the Renaissance. Prerequisite: Italian 221 or consent of instructor. 3 hours.
290. **Readings in Italian.** Readings chosen in consultation with an adviser. Prerequisite: Italian 104 or consent of instructor. 2 to 4 hours. May be repeated for credit.
293. **Honors Senior Thesis.** For candidates for honors in Italian. 2 hours. May be repeated.

309. **Petrarch and Boccaccio: Literature of the Italian Middle Ages.** Same as Comparative Literature 353. Studies in Petrarch and Boccaccio; nonconcentrators in Italian may read the works in translation; lectures are in English. Prerequisite: Fulfillment of campus rhetoric requirement. 3 hours or 3/4 unit.
311. **Dante: La Divina Commedia, I.** Prerequisite: Italian 222 or consent of instructor. 3 hours or 3/4 unit.
313. **The Divine Comedy.** Same as Comparative Literature 313. An interpretation of Dante's Divine Comedy with special attention to its position in the medieval world; a knowledge of Italian not required. Prerequisite: Junior standing. 2 hours or 1/2 unit.
321. **Modern Italian Literature, I.** Prerequisite: Italian 222 or consent of instructor. 3 hours or 3/4 unit.
322. **Modern Italian Literature, II.** Prerequisite: Italian 321 or 222, or consent of instructor. 3 hours or 3/4 unit.
331. **Italian Culture.** Introduction to factors that have shaped present-day Italy; basic concepts contributing to understanding its present social and cultural development. Prerequisite: Italian 211 or 221, or consent of instructor. 3 hours or 1/2 unit.
333. **Masterpieces of Italian Renaissance Literature.** Same as Comparative Literature 354. A reading of masterpieces of the 1400 and 1500s and a study of their predecessors and influence; nonconcentrators in Italian may read the works in translation; lectures are in English. Content rotates. Prerequisite: Fulfillment of campus rhetoric requirement. 3 hours or 3/4 unit. May be repeated to a maximum of 6 hours or 1 1/2 units with consent of instructor.
362. **Introduction to Romance Linguistics.** Same as French, Linguistics, Portuguese, Romance Linguistics, and Spanish 362. See Spanish 362.
400. **Beginning Course for Graduate Students.** Basic grammar and vocabulary; reading practice. 4 hours. No graduate credit.
401. **Readings in Italian for Graduate Students.** An intensive language course designed to teach reading skills to graduate students; a continuation of Italian 400. Prerequisite: Italian 400 or consent of instructor. 4 hours. No graduate credit.
415. **Italian Literature of the Renaissance.** 1 unit.
416. **Italian Literature of the Renaissance.** 1 unit.
447. **Introduction to Romance Stylistics.** Same as French, Portuguese and Spanish 447. See Spanish 447.
451. **History of the Italian Language.** 1 unit.
452. **Seminar in Italian Linguistics.** 1 unit.
462. **Seminar in Romance Linguistics.** Same as French, Linguistics, Portuguese, Romance Linguistics, and Spanish 462. See Spanish 462.
491. **Special Topics in Italian.** 1/2 or 1 unit.
499. **Thesis Research.** 0 to 4 units

Portuguese

101. **Elementary Portuguese, I.** For students who have no credit in Portuguese. All students in this course are required to attend two twenty-minute laboratory sessions per week in the language laboratory. 4 hours.
102. **Elementary Portuguese, II.** Continuation of Portuguese 101. Prerequisite: Portuguese 101. All students in this course are required to attend two twenty-minute laboratory sessions per week in the language laboratory. 4 hours.
103. **Intermediate Portuguese.** Rapid reading, review of grammar, composition, and conversation. Prerequisite: Portuguese 102 or two years of high school Portuguese. 4 hours.
104. **Intermediate Portuguese.** Continuation of Portuguese 103. Prerequisite: Portuguese 103 or three years of high school Portuguese. 4 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
211. **Composition and Conversation, I.** Prerequisite: Portuguese 104 or consent of instructor. 3 hours.

- 212. Composition and Conversation, II.** Prerequisite: Portuguese 211 or consent of instructor. 3 hours.
- 221. Introduction to Portuguese Literature.** Survey of the most representative works from the Middle Ages to the present with emphasis on the evolution of the country's literary history. Prerequisite: Portuguese 104 or consent of instructor upon demonstrating competency in reading Portuguese. 3 hours.
- 222. Introduction to Brazilian Literature.** Survey of the most representative works from the sixteenth century to the present with emphasis on the evolution of the country's literary history. Prerequisite: Portuguese 221 or consent of instructor. 3 hours.
- 290. Readings in Portuguese.** Readings chosen in consultation with a departmental adviser. Prerequisite: Portuguese 104 or consent of instructor. 2 to 4 hours.
- 301. Brazilian Literature.** Prerequisite: Portuguese 222 or consent of instructor. 3 hours or 3/4 unit.
- 302. Portuguese Literature.** Prerequisite: Portuguese 222 or consent of instructor. 3 hours or 3/4 unit.
- 303. Luso-Brazilian Culture.** Affords a broad understanding of the origins of Luso-Brazilian civilization and culture. Prerequisite: Portuguese 211 or 221, or consent of instructor. 3 hours, or 1/2 or 1 unit.
- 304. Brazilian Culture.** Affords a broad understanding of contemporary Brazilian civilization and culture. Prerequisite: Portuguese 211 or 221, or consent of instructor. 3 hours, or 1/2 or 1 unit.
- 305. Intensive Portuguese for Spanish Speakers.** An accelerated course based on Portuguese-Spanish contrastive analysis; designed to enable students who can already read Spanish to read nonliterary and literary works in Portuguese and to develop a modicum of listening comprehension. Prerequisite: Spanish 104 or equivalent, or consent of instructor. 3 hours or 1/2 unit.
- 362. Introduction to Romance Linguistics.** Same as French, Italian, Linguistics, Romance Linguistics, and Spanish 362. See Spanish 362.
- 407. Studies in Brazilian Literature.** Advanced study of literary movements, major writers, and intellectual and cultural ideas in Brazilian literature; subject matter varies each time the course is offered. Prerequisite: Portuguese 301 or consent of instructor. 1 unit. May be repeated for credit as topic varies for a maximum of 2 units.
- 408. Studies in Portuguese Literature.** Advanced study of literary movements, major writers, and intellectual and cultural ideas in Portuguese literature; subject matter varies each time the course is offered. Prerequisite: Portuguese 302 or consent of instructor. 1 unit. May be repeated for credit as topic varies for a maximum of 2 units.
- 447. Introduction to Romance Stylistics.** Same as French, Italian and Spanish 447. See Spanish 447.
- 462. Seminar in Romance Linguistics.** Same as French, Italian, Linguistics, Romance Linguistics, and Spanish 462. See Spanish 462.
- 491. Special Topics in Portuguese.** 1/2 or 1 unit.
- 499. Thesis Research.** 0 to 4 units

Romance Linguistics

- 362. Introduction to Romance Linguistics.** Same as French, Italian, Linguistics, Portuguese, and Spanish 362. See Spanish 362.
- 462. Seminar in Romance Linguistics.** Same as French, Italian, Linguistics, Portuguese, and Spanish 462. See Spanish 462

Rumanian

- 301. Structure of Rumanian.** Analysis of the sound system and grammar of contemporary literary Rumanian. 3 hours or 1/2 unit.
- 302. Structure of Rumanian.** Continuation of Rumanian 301. Prerequisite: Rumanian 301. 3 hours or 1/2 unit

Spanish

Students in elementary and intermediate language courses may not ordinarily register for credit in more than one course at the same semester level (e.g., 104 or 114 or 124). Approval to do so must be obtained from the department.

- 101. Elementary Spanish.** For students who have no university credit in Spanish. 4 hours.
- 102. Elementary Spanish.** Continuation of Spanish 101. Prerequisite: Spanish 101 at the University of Illinois at Urbana-Champaign. All other second semester Spanish students should enroll in Spanish 122. 4 hours.
- 103. Intermediate Spanish, I.** Continued development of reading, writing, and conversational skills for students who may be interested in pursuing Spanish in more advanced courses. Unlike Spanish 123, Spanish 103 places considerable emphasis on written expression in Spanish. Followed by Spanish 104, 114, or 124, this course fulfills the LAS foreign language requirement. Prerequisite: Spanish 102 or 122, or equivalent placement score. 4 hours.
- 104. Intermediate Spanish, II.** Continuation of Spanish 103 for students who may be interested in pursuing Spanish in more advanced courses; continued emphasis on written and oral expression and on the reading of advanced texts. Completion of this course fulfills the LAS foreign language requirement. Prerequisite: Spanish 103 or equivalent placement score. 4 hours.
- 107. Intensive Intermediate Spanish.** For students who wish to complete the third and fourth semesters of Spanish at a rapid rate. Grammar review, readings, and cultural history; conducted in Spanish. Prerequisite: Spanish 102 or 122, or equivalent placement score. 8 hours.
- 114. Conversational Spanish.** Conversation in Spanish on topics of current interest; brief grammar review as necessary to improve oral skills; and reading required in preparation for classroom discussions. Fulfills the foreign language requirement but does not serve as prerequisite for advanced courses in Spanish without departmental approval. Background readings in Spanish and English. Prerequisite: Spanish 103 or 123, or equivalent placement score. 4 hours.
- 122. Elementary Spanish.** Second-semester Spanish course for all students who did not take Spanish 101 at this University. Prerequisite: Spanish 101 elsewhere or assignment by placement exam. 4 hours.
- 123. Reading and Speaking Spanish, I.** Readings of Spanish literary and cultural texts with discussion in Spanish; review and development of grammar essential to competence in reading and speaking. Followed by Spanish 114 or 124, this course fulfills the LAS foreign language requirement. Students completing Spanish 123 may not enroll in Spanish 104 without departmental approval. Students planning to take advanced courses in Spanish should enroll in Spanish 103. Prerequisite: Spanish 102 or 122, or equivalent placement score. 4 hours.
- 124. Reading and Speaking Spanish, II.** Continuation of Spanish 123. Readings of Spanish literary and cultural texts with discussion in Spanish; continued development of conversational skills. This course fulfills the LAS foreign language requirement, but does not serve as a prerequisite for more advanced courses in Spanish without departmental approval. Students planning to take additional courses

- in Spanish should enroll in Spanish 104. Prerequisite: Spanish 103 or 123, or equivalent placement score. 4 hours.
125. **Beginning Spanish for Near-Native Speakers.** Introduction to Spanish orthography, syntax and vocabulary for students of Hispanic background who have had little or no formal training in the Spanish language. Prerequisite: Consent of instructor. 4 hours.
 191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
 199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
 200. **Introduction to the Study of Hispanic Literature.** Basic terminology and techniques for the study of the major literary genres; should be taken prior to any Spanish literature course. Prerequisite: Spanish 209 and 211, or equivalent; or concurrent registration in Spanish 209 and 211 with consent of advisor and instructor. 2 hours.
 209. **Spanish Language.** A practical course on Spanish phonology and morphology; intensive drill in Spanish sound and verb systems, and analysis of sentence structure. Prerequisite: Spanish 104 or consent of instructor. 3 hours.
 211. **Oral Spanish.** Practice in speaking Spanish; to be taken concurrently with or subsequent to Spanish 209. Meets four hours per week. Prerequisite: Spanish 104. 2 hours.
 215. **Intensive Spoken Spanish.** Intensive oral contact with Spanish; meets five hours per week. Prerequisite: Spanish 211 or consent of instructor. 2 hours. May be repeated once for credit.
 217. **Spanish Composition.** Basic composition course; problems of written Spanish and principles of Spanish rhetorical patterns; weekly written exercises. Prerequisite: Spanish 209 and junior standing, or consent of instructor. 3 hours.
 225. **Intermediate Spanish for Near-Native Speakers.** Review at the intermediate level of Spanish orthography, syntax, and vocabulary for students of Hispanic background who have little or no formal training in the Spanish language and an introduction to the study of U.S. Hispanic minority literature. This course fulfills the LAS foreign language requirement. Prerequisite: Spanish 125 or consent of instructor. 3 hours.
 226. **Survey of Hispanic Minority Literature.** A survey of literature in English by and about people of Mexican, Puerto Rican, and Cuban descent in the United States. 3 hours.
 227. **Black Experience in Hispanic Literatures.** Same as Afro- American Studies 227. A survey of literature by and about people of African descent in Spain and Spanish America; readings in English. 3 hours.
 232. **Culture of Spain.** Prerequisite: Spanish 200, 209, and 211, or consent of instructor. 2 hours.
 233. **Culture of Spanish America.** Designed for concentrators in Spanish; offered in Spanish. Prerequisite: Spanish 200, 209, and 211, or consent of instructor. 2 hours.
 240. **Spanish Literature: Medieval and Golden Age.** Introduction to major works and movements of the Middle Ages and the Golden Age. Prerequisite: Spanish 200, 209, and 211, or consent of instructor. 3 hours.
 241. **Spanish Literature: Eighteenth Century to the Present.** Study of representative masterpieces within the context of major periods and trends. Prerequisite: Spanish 200, 209, and 211, or consent of instructor. 3 hours.
 242. **Spanish-American Literature.** Introduction to major literary movements and works in Spanish America. Prerequisite: Spanish 200, 209, and 211, or consent of instructor. 3 hours.
 250. **The Worlds of Jorge Luis Borges and Julio Cortazar.** Same as Comparative Literature 244. The major works of two of the most important contemporary writers. of Spanish-American fiction are read in translation and analyzed in English. 3 hours.
 255. **The World of Cervantes.** Same as Comparative Literature 243. An analysis entirely in English of Cervantes' masterpiece *Don Quixote* and of his Exemplary

- Stories; designed to convey an appreciation of the cultural significance of the baroque period as the end of the Renaissance and the beginning of the modern epoch; no knowledge of Spanish required. 3 hours.
260. **Spanish for Industry and Commerce.** Introduction to vocabulary of Hispanic commerce; composition of business letters and similar texts. Prerequisite: Spanish 104 or consent of instructor. 3 hours.
 270. **Parateaching.** Same as French, German, Latin, and Russian 270. See French 270.
 279. **Introduction to Foreign Language Education.** Same as French, German, Humanities, Latin, and Russian 279. See Humanities 279.
 280. **Teachers Course.** Required for teacher-training majors in Spanish. Prerequisite: Spanish 209 or 211, or consent of instructor. 4 hours.
 293. **Honors Senior Thesis.** For candidates for honors in Spanish. 2 hours. May be repeated.
 298. **Senior Seminar.** Intensive study of Hispanic linguistics or literature. Prerequisite: Senior standing. 2 hours. May be repeated for credit with adviser's consent.
 305. **Romanticism and Realism in Nineteenth-Century Spanish Literature.** A study of representative authors and genres of the nineteenth century; particular emphasis on the romantic drama and the realistic novel. Prerequisite: Spanish 241 or equivalent. 3 hours or 3/4 unit.
 306. **The Generation of 1898.** A study of representative works of Baroja, Azorin, Unamuno, Maeztu, Valle Inclan, Benavente, A. Machado, and others. Prerequisite: Spanish 241 or equivalent. 3 hours or 3/4 unit.
 307. **Spanish-American Literature to 1910.** Study of the development of Spanish-American literature from its sixteenth-century beginnings through modernismo. Graduate students read one additional major literary work and write an additional paper on that work. Prerequisite: Spanish 242 or equivalent. 3 hours or 3/4 unit.
 309. **Introduction to Medieval Spanish Literature.** Historical and cultural background for the Middle Ages; selected readings in medieval literature from the Jarchas to the Corbacho. Prerequisite: Spanish 240 or equivalent. 3 hours or 3/4 unit.
 310. **Contemporary Spanish-American Literature.** A study of Spanish-American literature from World War I to the present. Prerequisite: Spanish 242 or equivalent. 3 hours or 3/4 unit.
 311. **Don Quixote and the Prose of the Golden Age.** Introduction to Don Quixote, to its relationship to other selected masterpieces of the Golden Age, and to the main currents and forms of Golden Age prose. Prerequisite: Spanish 240 or equivalent. 3 hours or 3/4 unit.
 313. **Chicano Literature.** A survey of literature in Spanish by and about people of Mexican descent in the United States. Prerequisite: Spanish 233 and 242. 3 hours or 3/4 unit.
 314. **Spanish Drama and Poetry of the Golden Age.** Prerequisite: Spanish 240 or equivalent. 3 hours or 3/4 unit.
 315. **Puerto Rican Literature.** A study of representative authors and genres of Puerto Rican literature since World War II. Prerequisite: Spanish 242 or equivalent. 3 hours or 3/4 unit.
 351. **Phonetics.** Prerequisite: Spanish 209 or equivalent. 3 hours or 1/2 unit.
 352. **Syntax.** Required for teacher-training majors in Spanish. Prerequisite: Spanish 209 or equivalent. 3 hours or 1/2 unit.
 353. **Spanish Structure.** Same as Linguistics 353. Comprehensive analysis of Spanish phonology and syntax based on present-day linguistic theory. Prerequisite: Linguistics 300; Spanish 351; Spanish 352. 3 hours or 1/2 unit.
 360. **Principles of Language Testing.** Same as English as a Second Language, French, and German 360. See English as a Second Language 360.
 362. **Introduction to Romance Linguistics.** Same as French, Italian, Linguistics, Portuguese, and Romance Linguistics 362. Comparative and historical analysis of the Romance languages. Prerequisite: Four semesters of a Romance language or Latin, or equivalent. 3 hours or 3/4 unit.

371. **Spanish for Teachers.** A consideration of language problems suggested by teaching experience. Prerequisite: Spanish 209 or equivalent. 2 hours or 1/2 unit. Offered in the summer session only.
382. **Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as a Second Language, French, German, Humanities, and Slavic 382, and Linguistics 386. See Humanities 382.
399. **Study Abroad.** Lectures, seminars, and practical work in Spanish language, literature, and civilization in Spain. Prerequisite: Spanish 200 and 211, or equivalent. 0 to 18 hours, 0 to 3 units.
400. **Beginning Spanish for Graduate Students.** Basic grammar and vocabulary; reading practice. 4 hours. No graduate credit.
401. **Readings in Spanish for Graduate Students.** Continuation of Spanish 400; special readings in the critical literature of several disciplines. Prerequisite: Spanish 400 or consent of instructor. 4 hours. No graduate credit.
405. **Spanish Bibliography.** An introduction to bibliographical method and to the principal bibliographical resources for the study of Spanish and Latin American literature. 1/2 unit.
411. **Medieval Literature to 1300.** Survey of medieval Spanish literature to 1300; special attention to relationship with other medieval literatures of western Europe. Prerequisite: Spanish 309. 1 unit.
412. **Medieval Literature, 1300-1500.** Survey of medieval Spanish literature from 1300 to 1500; special attention to relationship with other medieval literatures of western Europe. Prerequisite: Spanish 309. 1 unit.
415. **Renaissance and Baroque Prose in Spain.** Prerequisite: Spanish 311 and 314, or equivalent. 1 unit.
417. **Renaissance and Baroque Drama in Spain.** Prerequisite: Spanish 311 or 314, or consent of instructor. 1 unit.
418. **Seminar in Renaissance and Baroque Literature.** Same as Comparative Literature 404. 1 unit. May be repeated for credit as topic varies for a maximum of 2 units.
419. **Cervantes.** Don Quixote and representative minor works. Prerequisite: Spanish 311 or 314, or consent of instructor. 1 unit.
420. **Studies in Medieval Spanish Literature.** Advanced study of the major literary movements, genres, and authors in medieval Spanish literature. Topics vary. Prerequisite: Spanish 309 or equivalent. 1 unit. May be repeated for credit as topic varies for a maximum of 2 units.
421. **Modern Spanish Novel and Essay.** 1 unit.
422. **Contemporary Spanish Novel and Essay.** 1 unit.
423. **Modern Spanish Drama.** Dramatic literature of Spain in the eighteenth and nineteenth centuries. 1 unit.
424. **Contemporary Spanish Drama.** Dramatic literature of Spain in the twentieth century. 1 unit.
425. **Renaissance and Baroque Poetry in Spain.** 1 unit.
426. **Spanish Poetry of the Nineteenth and Twentieth Centuries.** 1 unit.
427. **Studies in Twentieth-Century Spanish Literature.** Advanced study of major literary movements, genres, or authors in twentieth-century Spanish literature; subject matter varies. Prerequisite: Spanish 306 or any survey of contemporary Spanish literature, or equivalent. 1 unit. May be repeated for credit as topic varies for a maximum of 2 units.
428. **Studies in Nineteenth-Century Spanish Literature.** Advanced study of major literary movements, genres, or authors in nineteenth-century Spanish literature; subject matter varies. Prerequisite: Spanish 305 or equivalent. 1 unit. May be repeated for credit as topic varies for a maximum of 2 units.
429. **Studies in Golden Age.** Advanced study of major literary movements, genres, or authors in sixteenth- and seventeenth- century Spanish literature; subject matter varies. Prerequisite: Spanish 311 or 314, or any survey of Spanish literature. 1 unit. May be repeated for credit as topic varies for a maximum of 2 units.

430. **Studies in Twentieth-Century Spanish-American Literature.** Advanced study of major literary movements, genres, or authors in twentieth-century Spanish-American literature; subject matter varies. Prerequisite: Spanish 307 or 310, or equivalent. 1 unit. May be repeated for credit as topic varies for a maximum of 2 units.
432. **Spanish-American Poetry.** The development and major exponents of Spanish-American poetry from the beginnings to the present. Prerequisite: Spanish 307 and 310, or equivalent. 1 unit.
434. **Spanish-American Novel.** Major movements and writers in the development of the Spanish-American novel from its beginnings to the present. Prerequisite: Spanish 307 and 310, or equivalent. 1 unit.
435. **Seminar in Spanish-American Poetry.** Prerequisite: Spanish 432. 1 unit. May be repeated for credit as topic varies for a maximum of 2 units.
436. **Seminar in Spanish-American Novel.** Same as Comparative Literature 462. Special problems in methodology and research; includes other prose fiction. Prerequisite: Spanish 434. 1 unit. May be repeated for credit as topic varies for a maximum of 2 units.
437. **Spanish-American Drama.** Prerequisite: Spanish 307 or 310. 1 unit.
438. **Spanish-American Essay.** Prerequisite: Spanish 307 or 310. 1 unit.
439. **The Spanish-American Short Story.** Intensive and analytical study of the principal cuentistas of Spanish America. Prerequisite: Spanish 307 and 310, or equivalent. 1 unit.
442. **Seminar in Modern Spanish Literature.** Study of problems in the works of a major writer or group of writers of the eighteenth or nineteenth centuries. Prerequisite: Spanish 305; Spanish 421 or 423, or equivalent. 1 unit. May be repeated for credit as topic varies for a maximum of 2 units.
444. **Seminar in Spanish Realism and Naturalism.** Research work in nineteenth-century literary theory and practice in novel and drama. Prerequisite: Spanish 421 and 442. 1 unit.
445. **Seminar in Twentieth-Century Spanish Literature.** Investigation of literary problems presented by the Spanish novel, drama, and/or essay since 1900. Prerequisite: Spanish 421, 422, 423, or 424, or equivalent. 1 unit. May be repeated for credit as topic varies for a maximum of 2 units.
447. **Introduction to Romance Stylistics.** Same as Italian, Portuguese and French 447. A brief history of the schools and theories of Romance stylistics, especially the French-Swiss *stylistique* (Bally, Marouzeau, and Cressot) and the German- *Stilforschungen* (Spitzer, Hatzfeld, Kayser, A. Alonso, and D. Alonso); includes a study of representative works and assigned topics for analysis. Prerequisite: Graduate standing in one of the Romance languages; reading knowledge of French and Spanish or consent of instructor. 1 unit.
451. **Seminar in Spanish Descriptive Linguistics.** Selected topics of Spanish phonology and syntax in the light of present-day linguistic theory. Prerequisite: Consent of instructor. 1 unit. May be repeated for credit as topic varies for a maximum of 2 units.
452. **Seminar in Spanish Historical Linguistics.** Selected topics on the development of Spanish and its dialects in the light of present-day historical methods. Prerequisite: Consent of instructor. 1 unit. May be repeated for credit as topic varies for a maximum of 2 units.
453. **History of the Spanish Language.** 1 unit.
454. **Old Spanish.** 1 unit.
455. **Historical Spanish Grammar.** Internal history of the Spanish language; phonological, morphological, and syntactic evolution from Latin to modern Spanish. Prerequisite: Two semesters of college Latin or equivalent. 1 unit.
460. **Seminar in Medieval Spanish Literature.** Research work in medieval Spanish literature; theory and practice. Topics vary. Prerequisite: Spanish 411 or 412, and 453 or 454. 1 unit. May be repeated for credit as topic varies for a maximum of 2 units.

462. **Seminar in Romance Linguistics.** Same as French, Italian, Linguistics, Portuguese, and Romance Linguistics 462. Selected topics in comparative Romance linguistics. Prerequisite: Spanish 362 and consent of instructor. 1 unit. May be repeated as topic varies.
463. **College Teaching of Foreign Languages.** Same as English as a Second Language, French, German, and Russian 463. See French 463.
471. **Applied Linguistics and Teaching College Spanish.** Study of the structure of Spanish with special emphasis on the teaching situation in elementary Spanish courses. 1 unit.
481. **Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as English as a Second Language, French, German, and Russian 481. See French 481.
491. **Special Topics in Spanish.** 1/2 or 1 unit.
499. **Thesis Research.** 0 to 4 units

SPECIAL EDUCATION

Chairperson of Department: Professor R. A. Henderson, Acting
Department Office: 288 Education Building, 1310 South Sixth, Champaign

117. **Exceptional Children.** Introduction to the study of children who deviate from the average in mental, physical, and social characteristics, including a study of the characteristics of such children and the adaptation of educational procedures to their abilities and disabilities. Prerequisite: Sophomore standing and/or Psychology 100. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Special Education in the Regular Classroom.** Examines principles underlying education of mildly/moderately handicapped children in the regular classroom; includes study of the application of basic principles (e.g., Least Restrictive Environment) to the education of handicapped children by use of simulation, small group problem-solving and role-playing activities. Intended for non-special education majors. 3 hours.
249. **Independent Study.** Permits study of problems not considered in other courses; designed for students who excel in self-direction and intellectual curiosity. Prerequisite: Upperclassman; upper 5 percent of class in grade-point average; demonstrated writing competence, research potential, scholarly attitude, and interest as attested to by instructors; consent of adviser and staff member who supervises the work. 2 hours.
291. **Thesis.** Prerequisite: Senior standing. 2 hours.
292. **Thesis.** Prerequisite: Senior standing. 2 hours.
305. **Remediation of Social Behavior Problems in Mildly Handicapped Students.** Examines basic principles of applied behavior analysis as they relate to assessing and remediating mild behavior problems particularly in the regular classroom; topics include: identifying and defining behaviors, charting and evaluating data, and selecting appropriate procedures to remediate problem behaviors. Prerequisite: Special Education 201 or consent of instructor. 3 hours or 1 unit.
306. **Remediation of Academic Behavior Problems in the Regular Classroom.** Examines the application of data-based instruction (DBI) techniques to assess and remediate academic behavior problems in the regular classroom; topics include: traditional educational assessment, curriculum-based assessment, application of DBI techniques to improve academic skills, and the role of the classroom teacher in educating students with mild learning and behavior problems. Prerequisite: Special Education 305 or consent of instructor. 3 hours or 1 unit.
307. **Special Needs Students in Secondary Schools.** Examines principles and techniques to help secondary teachers meet the needs of learning handicapped

students in regular classes; major emphases include task analysis, ordering of learnings, adapting materials, behavior management and techniques for individualizing education. Prerequisite: Secondary Education 229 or consent of instructor. 2 hours or 1/2 unit.

308. **Teaching Students with Learning and Behavior Problems in the Regular Classroom.** Examines the role of the regular classroom teacher in educating students with mild learning and behavior problems; topics include: identifying and describing learning and behavior problems, classroom behavior management techniques, remediation of academic skill deficits, and measuring and evaluating pupil progress. 3 hours or 1 unit.
309. **Vocational Education for Special Needs Learners.** Same as Vocational and Technical Education 309. See Vocational and Technical Education 309.
314. **Laboratory in Measurement of Exceptional Children.** Practice in administering, scoring, interpreting, and communicating the results of educational tests which may appropriately be given to exceptional children by classroom teachers; practicum sections offered by areas of exceptionality: mental retardation, learning disabilities, gifted, deaf, emotionally disturbed, and culturally disadvantaged. Prerequisite: Credit or concurrent registration in Special Education 324; consent of instructor. 2 hours or 1/2 unit. May be repeated to a maximum of 4 hours or 1 unit.
316. **The Gifted Child in School and Society.** A consideration of the gifted in society; who they are, their physical, psychological, social, and educational characteristics, and society's needs and provisions for them. The major portion of the course is devoted to the consideration and evaluation of instructional and administrative adjustments that should be made for the gifted in the educational structure. Prerequisite: Educational Psychology 211 or 236; consent of instructor. 3 hours, or 1/2 to 1 unit.
321. **Education of Disturbed and Conduct-Problem Children.** Studies the social, emotional and learning characteristics of children with behavioral and emotional problems, theories of causation and remediation, and delivery of educational and social services; discusses instructional and remedial techniques, but these are not the primary focus of the course. 3 hours or 1 unit.
322. **Psychology and Education of the Mentally Handicapped.** Study of the social, emotional, physical, and learning characteristics and problems of mentally handicapped children; identification and diagnosis; available services and provisions; and educational programs and curriculum of the school. Prerequisite: Consent of instructor. 3 hours or 1/2 unit.
324. **Mental and Educational Measurement of Exceptional Children.** Theoretical and practical considerations in psychological and educational evaluation of exceptional children; emphasis on understanding the technical and practical aspects of current testing procedures and their application to the education of exceptional children. Prerequisite: Special Education 117; consent of instructor. 3 hours or 1/2 unit.
325. **Data-Based Instruction: Academic Learning.** Examines the development and application of data-based procedures for assessment and remediation of basic academic skills by special education resource teachers; emphasizes the direct service role of resource teachers; and focuses on students typically labeled educable mentally handicapped, learning disabled, or behavior disordered. Prerequisite: Special Education 305. 3 hours or 1 unit.
332. **Characteristics and Methods of Educating the Multiply Handicapped.** Studies the physical and developmental characteristics of multiply handicapped individuals; places special emphasis upon individuals with cerebral palsy and other physical handicaps; and reviews methods of educational interventions and requires demonstration of competencies in rudimentary physical management of multiply handicapped individuals. 3 hours or 1 unit.
335. **Behavior Management and Systematic Instruction of the Moderately and Severely Handicapped.** Examines information on the assessment and management of social or emotional problems of moderately and severely handicapped persons; the

principles of applied behavior analysis serve as the focus for observation, planning, and treatment. Prerequisite: Special Education 117. 3 hours, or 1/2 or 1 unit.

336. **Instructional Methods for the Moderately, Severely, and Multiply Handicapped.** Examines the development and application of instructional plans for individuals with moderate, severe, and multiple handicaps; topics include: individualized educational programs, assessment strategies, selection of instructional objectives, task analysis, instructional methods, data collection, and program evaluation. 3 hours or 1 unit.
337. **Curriculum Development and Evaluation for the Moderately, Severely, and Multiply Handicapped.** Studies curriculum design, development, and adaptation for students with moderate, severe, and multiple handicaps; studies the following basic curriculum areas: motor, communication, self-care, socialization, vocational, community living, recreation, and functional academics; and emphasizes throughout the course the evaluation of curriculum and program effectiveness. Prerequisite: Special Education 336 or consent of instructor. 3 hours or 1 unit.
338. **Teaming with Parents and Staff: Communication, Training, and Cooperation.** Studies educational teams and the development, implementation, and evaluation of individualized educational programs for pupils with moderate, severe, and multiple handicaps; places special emphasis upon models of interactions, roles of team members, training of team members, and program coordination and evaluation of service delivery. 2 hours or 1/2 unit.
345. **Vocational Training for Mentally Retarded Adolescents and Adults.** Same as Vocational and Technical Education 345. Provides students with an orientation to a behavioral approach to vocational training for handicapped adolescents and adults; topics include training, managing and evaluating vocational behavior, total service planning, and competitive employment placement and follow-up. Prerequisite: Credit or concurrent enrollment in Special Education 335, or consent of instructor. 3 hours or 1 unit.
347. **Community Integration of the Handicapped.** Seminar for delivery of papers on topics related to the integration of handicapped adults into the community: residential alternatives, normalization, legal aspects, educational aspects, community aspects, etc.; examines ideological and empirical factors in community integration, including cost effectiveness analysis. 2 hours or 1/2 unit.
359. **Workshop and Laboratory in Curriculum and Methodology.** An intensive exploration of curriculum development in specialized areas of education. Requests for initiation of course sections are made by faculty or students. 2 or 4 hours, or 1/2 or 1 unit.
365. **Young Handicapped Children: Developmental Characteristics and Individual Programming.** Examines the development of young children in cognitive, social and motor domains, and the effect of handicapping conditions on such development; reviews existing curriculum models, and students learn to develop and use logical teaching sequences and interaction techniques; and uses microteaching in learning specific teaching skills. 3 hours or 1 unit.
410. **Law and the Handicapped.** Studies the legal rights of handicapped and disabled individuals with special emphasis on educational aspects; examines the inter-relationship of constitutional law, statute law, administrative law, and case law at the federal, state, and local levels. 1 unit.
411. **Drugs in Special Education.** Psychoactive drugs are used extensively with children in special education; this course involves a general survey of reasons for the prescription, behavioral effects as observed in the classroom, effects on the child's behavior at home, issues concerning the use of the drugs, and litigation about these issues. 1 unit.
417. **Psychoeducational Problems of Exceptional Children.** A course for educators, students in the behavioral sciences, and students beginning graduate study in special education; study of relevant research dealing with the physical, mental, emotional, and social traits of all types of exceptional children, and consideration of major

current problems in the development of educational programs. Prerequisite: Sixteen hours of psychology and/or education, or consent of instructor. 1 unit.

420. **The Social Psychology of the Handicapped.** Study of the social and emotional adjustment of handicapped children and adults, and of the somatopsychological significance of mental, sensory, and motor variations in the adjustive process; evaluation of effects of limitations imposed by the attitude of society, the attitude of the individual toward the handicap, and the handicap itself; and analysis of implications for current educational programs for the handicapped. Prerequisite: Special Education 117 or 417; Educational Psychology 312; or consent of instructor. 1 unit.
421. **Administration and Supervision of Special Education.** Designed for advanced graduate students preparing for administrative or supervisory positions in special education programs; examination of administrative and supervisory practices in educating exceptional children with emphasis on special education programs in the public schools; and application of administrative theory to special education programs. Field trips to observe and evaluate programs are required. Prerequisite: Special Education 417; Administration, Higher, and Continuing Education 450; consent of instructor. 1 unit.
422. **Theories of Academic Remediation.** Examines major theoretical approaches in the field of learning disabilities and critically evaluates them in light of research; topics include: definitions of learning disabilities, assessment and remediation strategies, critical evaluation of research, and issues in the field of learning disabilities. Prerequisite: Consent of instructor. 1 unit.
424. **Supervised Practice in Special Education.** Supervised practice in one or more settings in which either mildly or severely impaired students are served; practicum settings may include day, residential, special, and regular schools which serve handicapped students. Prerequisite: Admission to the graduate program in special education; consent of supervising faculty member. 1 unit.
425. **Principles and Practices of Resource/Consulting Teaching.** Sequel to Special Education 325 with continued emphasis upon data-based instruction in a direct service setting; in addition, emphasizes provision of indirect (consultation) services to regular classroom teachers. Prerequisite: Special Education 325 and one semester of Special Education 424. 1 unit.
426. **Theories and Practice of Consultation for Special Educators.** Focuses on aspects of resource/consulting teacher services which go beyond direct instruction services; emphasizes training resource room teachers to work as consultants to regular classroom teachers, parents and paraprofessionals. Students complete a series of consultation projects. 1 unit.
446. **Career Education for Mentally Retarded Adolescents and Adults.** Career education of mentally retarded populations emphasizing career awareness, exploration, and preparation; vocational, social, community, and daily skills training; and recent litigation and legislation. Prerequisite: Special Education 345. 1 unit.
449. **Independent Study.** Offers opportunity and challenge of self-directive, independent study, that is, develops the individual's ability as an independent student and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department chairman prior to enrollment. 1/2 or 1 unit. No more than 2 units may be offered toward an advanced degree except by consent of the dean of the College of Education.
456. **Problems and Trends in Special Education.** Introduces significant problems, points of view, and trends in the field concerned; explores significant research related to organization, content, and techniques in the field in question. Students are encouraged to make special studies in approved areas. Prerequisite: Consent of instructor. 1 to 2 units.
466. **Early Childhood Handicapped: Organization for Educational Intervention.** Prepares students to assume the various organizational and management roles necessary for developing and maintaining quality programs for handicapped young

children from birth to six years; gives attention to instructional roles such as behavior management and use of time, space, and materials, and to management roles such as developing staffing patterns and coordinating the classroom team. Prerequisite: Special Education 365 or consent of instructor. 1 unit.

483. **Single Subject Research Design.** Same as Educational Psychology 483. Studies research designs that require one or a few subjects; discusses issues of the validity of treatment comparisons and generalizability of results; and presents several statistical approaches for testing a priori hypotheses. Prerequisite: Educational Psychology 390 or equivalent. 1 unit.
490. **Seminar for Advanced Students of Education.** Seminar in the education of exceptional children; open only to persons who have been admitted for doctoral study. Sections may be offered in the following fields: (d) program planning and orientation; and (t) teacher education. 1 to 2 units.
491. **Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems; students present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze all presentations critically. Limited to students who have been admitted for doctoral study. 1 to 2 units.
499. **Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units

SPEECH AND HEARING SCIENCE

Acting Head of Department: Professor R. C. Bilger

Department Office: 901 South Sixth Street, Champaign

105. **Voice and Articulation.** Same as Speech Communication 105. Basic factors of voice and speech sound production; analysis of faults that result in minor speech deviations or inadequacies; and individual analysis and guided practice toward improvement of speech habits. 2 hours.
175. **A Survey of Historical and Professional Aspects of Speech Pathology and Audiology.** Survey of the fields of speech pathology and audiology; emphasis on historical and philosophical developments, relations to other professions, professional practice, and function and role in study of human communication. Prerequisite: Sophomore standing. 2 hours.
198. **Freshman Seminar.** A special experimental seminar or independent study course intended to cover topics not treated by regular course offerings; open to undergraduates at any level. Requests for activation of this course may be made by students or by faculty and should be directed to the head of the academic department concerned. While credit toward graduation is normally granted, credit toward satisfying specific college or departmental requirements is contingent upon approval by the appropriate college or departmental committee. 0 to 9 hours. May be repeated.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
208. **Speech and Hearing Problems in the Classroom.** An orientation of prospective teachers to speech and hearing problems encountered in the elementary and secondary schools; emphasis on description of problems and types of classroom management. Prerequisite: Junior standing. 3 hours.
290. **Individual Study.** Individual investigation of special problems. Prerequisite: Ten hours of speech and hearing science, and written approval by the faculty members who will supervise the student's work. 2 to 4 hours. May be repeated to a maximum of 6 hours.
291. **Honors Course.** Individual study leading either to a thesis or to departmental honors. Prerequisite: Senior standing; a grade point of 4.0 or consent of the head of the department. 2 hours. May be repeated to a maximum of 4 hours.

301. **General Phonetics.** Same as Speech Communication 301. Basic principles of phonetic study; includes observation and representation of pronunciation, ear training, and practice in transcription. Prerequisite: Junior standing. 3 hours, or 1/2 or 1 unit.
302. **Manual Communication, I.** Study of methods of manual communication with hearing impaired individuals; analysis of the language of signs and finger spelling in relation to origins, development, and structure; and extensive practice in manual communication. Prerequisite: Consent of instructor. 2 hours or 1/2 unit.
303. **Manual Communication, II.** Continuation of Speech and Hearing Science 302; an in-depth study of manual methods of communicating with hearing impaired individuals; particular emphasis on development of fluency in communicating with language-deficient deaf children and adults; and extensive practice in idiomatic language of signs. Prerequisite: Speech and Hearing Science 302 or consent of instructor. 2 hours or 1/2 unit.
317. **Psychosocial and Educational Aspects of Deafness.** Historical and current societal perceptions of deafness; an analysis of the various effects of auditory impairment on intelligence, on personal, social, and occupational adjustment, and on language and communication. Prerequisite: Special Education 117, and either Psychology 100 or Educational Psychology 211, or consent of instructor. 3 hours, or 1/2 to 1 unit.
319. **Special Education of the Deaf, I.** Survey of the curriculum and techniques in preschools, kindergarten, primary, and intermediate levels as applied to the hard of hearing, deafened, and deaf child; study of sense training, lip reading, vocabulary development, reading techniques, elementary school subjects, language and speech development, auditory training, and curriculum construction. Prerequisite: Consent of instructor. 5 hours, or 1 to 1 1/2 units.
320. **Special Education of the Deaf, II.** Continuation of Speech and Hearing Science 319. Prerequisite: Speech and Hearing Science 319. 5 hours, or 1 to 2 units.
348. **Speech and Language Clinical Methods in the Schools.** Same as Elementary and Early Childhood Education 348. Study of methods and materials used in the schools by the speech and language clinician. Prerequisite: Speech and Hearing Science 388. 3 hours or 1/2 unit.
375. **Speech Science, I.** Same as Speech Communication 375 and Linguistics 375. Introduction to the anatomical and physiological characteristics of the normal speech and hearing mechanisms, and to fundamental acoustics of speech. Prerequisite: Speech and Hearing Science/Speech Communication 301 or consent of instructor. 4 hours or 1 unit.
376. **Speech Science, II.** Same as Speech Communication 376 and Linguistics 376. Consideration of the physiology of the speaking act, the acoustical characteristics of voice and of speech sounds, and the hearing of speech. Prerequisite: Speech and Hearing Science 375. 4 hours or 1 unit.
378. **Hearing Science.** Acoustics, anatomy, and physiology of the auditory system; psychophysical methods; and a consideration of auditory theories and mechanics. Prerequisite: Speech and Hearing Science 375. 3 hours or 1/2 unit.
380. **Communication Disorders in Children: Habilitation and Rehabilitation.** Principles of differential diagnosis, therapeutic diagnosis, clinical and classroom habilitation, and rehabilitation of children with communicative disorders etiologically associated with neurological impairment, emotional disturbance, environmental deprivation, bilingualism, and mental retardation. Prerequisite: Speech and Hearing Science 383; senior or graduate standing; or consent of instructor. 3 hours, or 1/2 or 1 unit.
382. **Seminar in Development and Measurement of Spoken Language.** A review of the research and practical methodology associated with the development and measurement of spoken language. Prerequisite: Speech and Hearing Science 383 or consent of instructor. 3 hours or 1 unit.
383. **Development of Spoken Language.** Same as Speech Communication 383. Study of the correlates of language development from the prelinguistic period to adulthood. Prerequisite: Senior standing; consent of instructor. 3 hours or 1/2 or 1 unit.

384. **Introduction to Stuttering.** Study of the theoretical and research literature concerning the causes, diagnosis, and treatment of stuttering and an analysis of clinical procedures in stuttering therapy. Prerequisite: Senior standing. 3 hours, or 1/2 or 1 unit.
385. **Speech Pathology, I.** A study of the symptoms, causes, and treatment of articulation disorders. Prerequisite: Speech and Hearing Science 301 and credit or registration in 375, or consent of instructor. 3 hours or 1/2 unit.
386. **Language Disorders in Children.** Definition, etiology, and description of various types of language disorders in children; assessment and intervention for these clinical cases. Prerequisite: Speech and Hearing Science 383 or equivalent. 3 hours or 1 unit.
387. **Basic Principles in Speech Pathology.** Discussion, demonstration, and practice of clinical approaches used with speech and language disorders. Prerequisite: Speech and Hearing Science 385, 388, and 389. 5 hours or 1 unit.
388. **Speech Pathology, II.** A study of the symptoms, causes, and treatment of voice disorders. Prerequisite: Speech and Hearing Science 385 or consent of instructor. 3 hours, or 1/2 or 1 unit.
389. **Appraisal in Speech Pathology.** Introduction to principles of diagnosis; discussion of administration, scoring, and interpretation of tests utilized during speech and language evaluation. Prerequisite: Speech and Hearing Science 383 and 385, or consent of instructor. 3 hours or 1/2 unit.
390. **Introduction to Hearing Disorders and Audiometry.** Review of the history of audiology as a profession; study of symptoms, causes, and treatment of hearing losses; and principles and application of basic audiometry. 4 hours or 1 unit.
392. **Diagnosis of Hearing Impairments in Infants and Young Children.** Symptoms and causes of hearing impairment in young children; practice in procedures used for the measurement of residual hearing; and the selection and use of hearing aids. Prerequisite: Speech and Hearing Science 390 and 391, or consent of instructor. 3 hours, or 1/2 or 1 unit.
393. **Aural Habilitation and Rehabilitation.** Principles and methods of clinical and classroom retraining of the hard-of-hearing; includes lip reading, auditory training, speech disorders and conversation, and counseling. Required in curriculum of teacher training in speech and hearing science. Prerequisite: Speech and Hearing Science 390; grade point average of at least 3.5; consent of instructor. 3 hours, or 1/2 or 1 unit.
398. **Practicum in Audiology.** Observation, practice, and research in diagnosis and rehabilitation of auditory disorders. Students may repeat either Speech and Hearing Science 387 or 398, but not both, for 3 hours. Prerequisite: Speech and Hearing Science 389 and 393. 3 hours or 1/2 unit.
399. **Design and Analysis of Experiments in Speech and Hearing Science.** An introduction to experimental designs and methods of statistical analysis in speech and hearing research. Prerequisite: Graduate standing or consent of instructor. 3 hours, or 1/2 or 1 unit.
401. **Applied Phonology.** A survey of basic knowledge concerning normal and deviant phonological development, and principles for applying this knowledge to the assessment and remediation of phonological disorders. Prerequisite: Graduate standing or consent of instructor. 1 unit.
418. **Communication and Language Problems of the Hearing Impaired, I.** An advanced course in the problems and procedures involved in the acquisition of language and communication by persons with severe hearing impairment, particularly those with profound prelingual deafness; emphasis on research and measurement in the development of speech, speechreading, residual hearing, reading, written language, and manual communication, including finger spelling and the language of signs; and stress on the applications of recent approaches in linguistics and psycholinguistics to language development. Prerequisite: Consent of instructor. 1 unit.
419. **Communication and Language Problems of the Hearing Impaired, II.** Continuation of Speech and Hearing Science 418. Problems of language and

- communication of persons with hearing impairments ranging from mild to profound; research findings and measurement techniques for assessing the development of speech, speechreading, residual hearing, reading, written language, and manual communication. Prerequisite: Speech and Hearing Science 418. 1 unit.
475. **Experimental Phonetics, I.** Same as Linguistics 475. Theoretical consideration of speech as motor behavior; special reference to physiological investigations of normal respiration, phonation, and articulation; and survey of the experimental literature. Prerequisite: Consent of instructor. 1 unit.
476. **Experimental Phonetics, II.** Same as Linguistics 476. Theoretical consideration of speech as an acoustical phenomenon; special reference to acoustical investigations of voice and speech sounds; and survey of the experimental literature. Prerequisite: Consent of instructor. 1 unit.
481. **Seminar in Neuropathologies of Speech and Language.** Advanced study of speech, vocal, and linguistics problems associated with cerebral palsy and aphasia; topics offered in rotation, one or two each semester, include neurological aspects, aphasia, and cerebral palsy. Prerequisite: Consent of instructor. 1 unit. May be repeated for a maximum of 3 units.
482. **Seminar in Stuttering.** Advanced study of stuttering disorders; topics vary, but emphasis is placed on measurement, clinical evaluation, and therapeutic methods. Prerequisite: A course in stuttering. 1 unit.
483. **Psychology of Speech and Hearing Disorders, I.** Same as Psychology 483. Survey of psychological techniques utilized in the clinical and experimental study of speech and hearing disorders, with special reference to speech disorders; review of research findings and development of experimental designs. Prerequisite: Consent of instructor. 1 unit.
484. **Psychology of Speech and Hearing Disorders, II.** Same as Psychology 484. Survey of psychological techniques utilized in the clinical and experimental study of speech and hearing disorders, with special reference to hearing disorders; review of research findings and development of experimental designs. Prerequisite: Consent of instructor. 1 unit.
486. **Advanced Clinical Techniques in Speech and Hearing.** Semi-independent management of complex cases; participation in examination and analysis; topics offered each semester include theory of clinical practice, speech pathology, audiology, language disorders, and field study. Prerequisite: Consent of instructor. 1/2 to 4 units.
488. **Diagnostic Procedures in Pathologies of Speech and Language.** A study of diagnostic procedures in speech and language to aid the student in developing an eclectic approach to the diagnostic process. Prerequisite: Consent of instructor. 1 unit.
489. **Seminar in Orofacial Anomalies and Laryngeal Pathologies of Speech.** Advanced study of speech and vocal problems associated with cleft palate, laryngeal dysfunctions, and facial-maxillary disturbances; topics offered in rotation, one each semester, include cleft palate and vocal problems. Prerequisite: Consent of instructor. 1 unit. May be repeated for a maximum of 2 units.
490. **Medical Aspects of Speech Disorders and Audiology.** Study of acute and chronic hearing and speech disorders traceable to disease of the ear and vocal mechanisms in relation to the techniques and philosophies utilized in a medically oriented environment. Prerequisite: Speech and Hearing Science 385, 388, and 486. Offered in alternate years. 1 unit.
491. **Seminar in Hearing Disorders.** Principles and methods of clinical management of all types of hearing disorders; survey of current literature and research. The following topics are offered in rotation, one or two each semester: automatic audiometry, aural rehabilitation, and hearing aids and amplification. Prerequisite: Speech and Hearing Science 390. 1 unit. May be repeated for a maximum of 3 units.
492. **Advanced Audiology.** Advanced study of rationale and development of principles associated with special techniques, procedures, and methods used in audiology. 1 unit.

- 495. **Special Problems.** Investigation of speech projects not included in theses. Prerequisite: Consent of head of the department. 1/2 to 2 units.
- 496. **Proseminar in Speech and Hearing Science.** Required seminar for all graduate students; involves reporting of ongoing research of faculty, visiting researchers, and students. 0 units.
- 499. **Thesis Research.** Individual research in the various areas of speech and hearing science. 0 to 4 units

SPEECH COMMUNICATION

Head of Department: Professor J. G. Delia

Department Office: 244 Lincoln Hall, 702 S. Wright, Urbana

- 101. **Principles of Effective Speaking.** Preparation and presentation of short informative and persuasive speeches; emphasis on the selection and organization of material, methods of securing interest and attention, and the elements of delivery. 3 hours.
- 102. **Introduction to Speech Communication.** Survey of the questions probed, the methods employed, and the current status of knowledge in the speech communication discipline; provides opportunities to understand the range of concerns and to explore specific areas of interest of the field. 4 hours.
- 105. **Voice and Articulation.** Same as Speech and Hearing Science 105. See Speech and Hearing Science 105.
- 107. **Parliamentary Procedure.** Principles and practice of parliamentary procedure. 2 hours.
- 111. **Verbal Communication.** Principles and practice in communication; stress on fundamentals of exposition in writing and speaking. The University rhetoric requirement is fulfilled by this course in conjunction with Speech Communication 112. 3 hours. Credit is not given for both Speech Communication 111 and 101.
- 112. **Verbal Communication.** Theory and practice of communication; stress on deliberation and fundamentals of persuasion through speaking and writing. The University rhetoric requirement is fulfilled by this course. Prerequisite: Speech Communication 111. 3 hours. Credit is not granted for both speech Communication 112 and 101.
- 113. **Group Discussion and Conference Leadership.** Study of leadership, group process, and interpersonal relations in the small group, conference, and the public forum; emphasis on practice in leading and participation in various types of public discussion and conference, with materials drawn from current public questions. Prerequisite: Sophomore standing. By permission of the head of the department the prerequisite may be waived for superior students, including James Scholars. 3 hours.
- 120. **Advanced Oral Communication.** Advanced principles of speech preparation and presentation; special problems and types of speeches; and considerable practice in composition and delivery of speeches. Prerequisite: Speech Communication 101 or equivalent. 3 hours.
- 123. **Public Discussion and Debate.** Study of and participation in public discussion and debate with emphasis on thorough preparation and research, principles of analysis, reasoning, evidence, and persuasive presentation of well-founded convictions; previous debate experience not required. 3 hours.
- 141. **Oral Interpretation.** Oral reading for understanding, appreciation, and communication. 3 hours.
- 142. **Group Oral Interpretation of Literature.** Study of modern modes of group presentation of literature; emphasis on practice in script preparation, directing, and performance in chamber theatre and readers' theatre. Prerequisite: Speech Communication 141 or consent of instructor. 2 hours.
- 157. **Elements of Stagecraft.** Same as Theatre 120. See Theatre 120.

161. **Fundamentals of Acting.** Same as Theatre 170. See Theatre 170.
177. **The Arts of Public Discourse.** The nature and forms of practical and artistic public speech, including adaptations for the mass audience. 4 hours.
178. **The Arts of the Theatre and Interpretative Speech.** The nature and forms of performing speech arts of theatre, interpretation, and film, including adaptations for the mass audience. 4 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
203. **Dramatics for Teachers.** Survey of methods and procedures of play production in the secondary school. 3 hours.
204. **Speech for Teachers.** A course in teaching methods designed for prospective teachers who are non-speech communication majors; discussion of methods and materials available for teaching speech and directing extracurricular speech activities. 3 hours.
207. **The Art of the Screen: Humor.** Study of selected comedies and other specimens of film and television humor in relation to theories of humor. Prerequisite: Consent of instructor. 3 hours.
210. **The Rhetorical Tradition.** Survey of major trends in the development of rhetorical theory from Homer to the present. 3 hours.
211. **Business and Professional Speaking.** Study, preparation, and presentation of the chief types of business speeches; special attention to conferences, sales talks, interviews, and job applications. Prerequisite: Speech Communication 101. 2 hours.
213. **Persuasion and the Arts.** Introduction to the study of narrative films, theatre, fiction, and poetry as vehicles of indirect and overt persuasion. 3 hours.
221. **Persuasion.** Study of the processes of motivation as applied to speeches intended to influence group opinion and action; practice in the preparation and delivery of short persuasive speeches. Prerequisite: Speech Communication 101; junior standing. 3 hours.
223. **Argumentation: Theory and Practice.** Study of the theory of argument, e.g., evidence, reasoning, and construction of briefs; practice in formal and informal forms of debate and public discourse on current public questions. Prerequisite: Speech Communication 101; sophomore standing. By permission of the head of the department the prerequisite may be waived for superior students, including James Scholars. 3 hours.
230. **Interpersonal Communication.** Study of communication theory and its application to interpersonal relations; extensive discussion of problems of conflict and misunderstanding in personal affairs to facilitate the development of knowledge, insights, and skills in the processes of face-to-face interaction. Prerequisite: Speech Communication 101 and sophomore standing; by permission of the head of the department, the prerequisite may be waived for superior students, including James Scholars. 3 hours.
243. **The Oral Interpretation of Shakespeare.** Analysis and oral presentation of selections from Shakespeare's plays. Prerequisite: Junior standing; Speech Communication 141. 2 hours.
247. **Teaching of Speech.** Same as Secondary Education 247. See Secondary Education 247.
252. **The Rhetoric of Dissent.** A study of the rhetorical strategies and tactics employed in selected cases of dissent in American political and social life. Prerequisite: Speech Communication 101 or 102, or consent of instructor. 3 hours.
253. **Case Studies in Public Discourse.** Detailed examination of selected cases of significant public discourse. Prerequisite: Speech Communication 101 or 102, or consent of instructor. 3 hours.
254. **Freedom of Speech and the Ethics of Speech Communication.** Examination of the nature and variety of responses to value questions concerning communication;

- includes a survey of the evolution of and current controversies in freedom of speech. Prerequisite: Speech Communication 101 or 102, or consent of instructor. 3 hours.
255. **Directing: Script Preparation.** Same as Theatre 281. See Theatre 281.
290. **Individual Study.** Individual investigation of special problems. Prerequisite: Twelve hours of speech communication; a grade-point average of 4.25; and consent of head of department. 2 hours. May be repeated for a maximum of 4 hours.
291. **Honors Individual Study.** Individual investigation of special problems. Prerequisite: Twelve hours of speech communication; a grade-point average of 4.50; and consent of head of department. 2 hours. May be repeated for a maximum of 4 hours.
293. **Honors Senior Thesis.** Individual study leading to a thesis for honors in the Department of Speech Communication. Prerequisite: Senior standing; a grade-point average of 4.50; and consent of head of department. 2 hours. May be repeated for a maximum of 4 hours.
301. **General Phonetics.** Same as Speech and Hearing Science 301. See Speech and Hearing Science 301.
307. **The Art of the Screen: Narration.** Same as Communications 307. Critical study of the adaptation and synthesis of principles of drama, literature, the graphic arts, and music in the evolution of the screen narrative; lectures, discussions, and reports; viewing of selected films and television programs. Prerequisite: Training in critical approaches to literature, drama, art, or music; consent of instructor. 3 hours, or 1/2 or 1 unit.
308. **The Art of the Screen: Exposition and Persuasion.** Same as Communications 308. Critical study of the application of the eclectic principles of the screen narrative to the transmission of information and the influencing of attitude, opinion, and action; lectures, discussions, and reports; viewing of selected films and television programs. Prerequisite: Speech Communication 307 or consent of instructor. 3 hours, or 1/2 or 1 unit.
313. **Interpersonal Communication: Discussion and Interview.** Advanced study of theory, research, techniques, and training methods in interviewing and group discussion; emphasis on empirical research findings concerning communication processes in face-to-face groups. Prerequisite: Junior standing or consent of instructor. 3 hours, or 1/2 or 1 unit.
315. **Greek, Roman, and Medieval Rhetorical Theory.** Same as Classical Civilization 315. Examination of the development of rhetorical theory, criticism, and pedagogy in Western thought; analysis of the contributions of major figures and works from Homer to the Renaissance. Prerequisite: Junior standing or consent of instructor. 3 hours, or 1/2 or 1 unit.
317. **Contemporary Rhetorical Theory.** Coverage of the major contributors to rhetorical theory from James and Winans to the present. 3 hours, or 1/2 or 1 unit.
319. **Russian and East European Cinema.** Same as Communications and Slavic 319. See Slavic 319.
320. **Argumentation and Public Decision Making.** Study of the philosophical, logical, and psychological bases of public decision making through discussion and debate. Prerequisite: Speech Communication 223 or consent of instructor. 3 hours, or 1/2 or 1 unit.
321. **Theories of Persuasion.** Survey of theories of persuasion derived from rhetorical, philosophical, and psychological sources and their application to persuasive discourse. Prerequisite: Speech Communication 221 or graduate standing. 3 hours, or 1/2 or 1 unit.
322. **Renaissance and Modern Rhetorical Theory.** Significant movements in the development of rhetorical theory in England, France, and America from 1500 to the present. Prerequisite: Senior standing. 3 hours, or 1/2 or 1 unit.
323. **Rhetorical Criticism.** Methods of interpreting and judging persuasive discourse with emphasis on political speaking and writing; lectures and practice in criticism. Prerequisite: Credit or concurrent registration in Speech Communication 322 or 350. 3 hours, or 1/2 or 1 unit.

324. **Persuasion in the Campaign and Movement.** Consideration of factors central to the sustained persuasive campaign or movement; special attention to the nature and functions of persuasion in the political campaign. Prerequisite: Speech Communication 221 or 321, or consent of instructor. 3 hours, or 1/2 or 1 unit.
332. **Sex-related Differences in Language.** Same as Linguistics 332. Study of actual and perceived differences and similarities in the use of language by women and by men; emphasizes the social contexts of speech. Prerequisite: A course in speech communication or linguistics, or equivalent. 3 hours or 1 unit.
335. **Interpersonal Communication Processes.** Same as Communications 335. Study of the major processes involved in an individual's adjustment to the communication situations of everyday life; emphasis on the development of interpersonal competency and orientations, social perception, interpersonal sentiment and hostility, trust, and the social context as factors influencing the understanding and evaluation of interpersonal messages. 3 hours, or 1/2 or 1 unit.
342. **Oral Interpretation of Poetry.** Analysis and oral presentation of literature representative of various poetic forms. Prerequisite: Speech Communication 141. 3 hours, or 1/2 or 1 unit.
344. **Criticism of the Oral Interpretation of Literature.** Examination of theories of aesthetics and practical criticism and their application to the criticism of specific examples of the oral performance of literature. Prerequisite: Speech Communication 141 or graduate standing, or consent of instructor. 3 hours, or 1/2 or 1 unit.
345. **Oral Interpretation of Prose Fiction.** Modern concepts underlying the relationship of interpretation to the reader's experience of literature; discussions, reports, and oral interpretations of prose forms (including chamber theatre and readers' theatre). Prerequisite: Speech Communication 141 or consent of instructor. 3 hours, or 1/2 or 1 unit.
350. **Selected Topics in the History and Criticism of Public Discourse.** Study of selected periods and genres of public discourse in historical context, including British, American, French, Russian, German, Chinese, and Japanese. Prerequisite: One course in rhetorical criticism or consent of instructor. 3 hours, or 1/2 or 1 unit. May be repeated with different content to a maximum of 12 hours or 4 units.
353. **Criticism of Contemporary Public Discourse.** Rhetorical criticism of selected aspects of contemporary public communication. 3 hours, or 1/2 or 1 unit.
374. **Introduction to Empirical Research Methods in Speech Communication.** Introduction to descriptive and experimental methods in speech communication; intended to produce understanding and critical evaluation of research designs. 3 hours or 1/2 unit.
375. **Speech Science, I.** Same as Linguistics and Speech and Hearing Science 375. See Speech and Hearing Science 375.
376. **Speech Science, II.** Same as Linguistics and Speech and Hearing Science 376. See Speech and Hearing Science 376.
383. **Development of Spoken Language.** Same as Speech and Hearing Science 383. See Speech and Hearing Science 383.
387. **Introduction to Myth and Folklore.** Same as Comparative Literature, English, German and Slavic 387. See English 387.
400. **Studies in Dramatic Form and Structure.** Same as Theatre 401. See Theatre 401.
403. **Seminar for Teachers of Speech.** Investigation of current principles, materials, and developments in the field of speech communication and of their relationship to the teacher. 1 unit.
417. **Contemporary Viewpoints in Speech Communication Theory.** Same as Communications 417. A readings seminar comparing the principal approaches to communication and rhetorical theory in the twentieth century along with a consideration of their philosophical assumptions. 1 unit.
429. **Seminar in Speech Communication.** Special topics in speech communication. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 4 units.

430. **Contemporary Theories of Oral Communication.** Systematic study of speech making and discussion as related to contemporary views of communication; examination of the theoretical literature and experimental evidence. Prerequisite: Consent of instructor. 1 unit.
436. **Seminar in Theories and Procedures of Discussion.** Intensive examination of selected problems of communication in small, task-oriented groups; evaluation of special instrumental forms, such as the unstructured group, the work group, the panel, and the lecture-forum; critical analysis of recent research in group communication as a means of making decisions and of changing attitudes and behavior. Prerequisite: Speech Communication 313 or equivalent. 1 unit.
437. **The Analysis of Interpersonal Interaction.** Same as Communications 437. Exploration of theory, methodology, and empirical findings of descriptive and experimental approaches to the analysis of verbal and nonverbal interaction processes, in both laboratory and naturalistic settings. Prerequisite: Speech Communication 335 or consent of instructor. 1 unit.
438. **Seminar in Rhetorical Theory.** Study of special topics in the history of rhetorical theory. 1 unit. May be repeated for a maximum of 4 units.
441. **Historical Background of Oral Interpretation.** Historical survey of British and American theories of interpretation. 1 unit.
442. **Seminar in Oral Interpretation.** Investigation of basic problems in the history, nature, and function of oral interpretation. Prerequisite: Speech Communication 441; consent of instructor. 1 unit.
443. **Seminar in the Oral Interpretation of Individual Literary Styles.** Examination of the literary style of an individual writer or selected writers, through research, discussion, and oral readings. See Timetable for current topics. 1 unit. May be repeated with a change in content to a maximum of 4 units.
465. **Seminar in Theatre Art.** Same as Theatre 407. See Theatre 407.
468. **Seminar in Theatre History.** Same as Theatre 406. See Theatre 406.
469. **Seminar in the Stage History of Classic English Plays.** Same as English 469 and Theatre 405. See English 469.
474. **Experimental Design in Speech Communication Research.** Detailed treatment of major issues and options in designs employed in speech communication research. Prerequisite: Speech Communication 374 or equivalent; introductory statistics course. 1/2 or 1 unit.
495. **Special Problems.** Individual investigation of special projects not included in theses. Prerequisite: Consent of head of department. 1/2 to 2 units. Open to master's candidates for a maximum of 1 unit, and to doctoral candidates for 1 or
499. **Thesis Research.** 0 to 4 units

SWAHILI

(See Linguistics)

TEXTILES AND INTERIOR DESIGN

(Including Interior Design and Textiles and Clothing)

Head of Department: Professor Marjorie Mead

Department Office: 237 Bevier Hall, 905 S. Goodwin, Urbana

Interior Design

160. **Residential Environments.** Design fundamentals utilized in the development and selection of housing to meet human needs; aesthetic, social, economic, structural, and functional aspects of residential environments. 3 hours.
161. **Introduction to Interior Design.** Theory and practice in the elements of interior design; intended primarily for students in the interior design curriculum. Laboratory-discussion. Prerequisite: Credit or concurrent registration in Interior Design 160; consent of instructor. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
260. **Interiors and Furniture, I.** Development of residential environments from prehistoric times to the nineteenth century as seen through the study of architecture and furniture design; consideration of the adaptation and use of period styles in contemporary interiors. Prerequisite: Art 119 or 185, or equivalent. 3 hours.
261. **Interiors and Furniture, II.** Continuation of Interior Design 260. Study of the development of residential environments of the nineteenth and twentieth centuries. Prerequisite: Interior Design 260. 3 hours.
262. **Interior Design.** Designing of interiors and their components; emphasis on design theory, presentation techniques, and evaluation of design concepts. Prerequisite: Interior Design 160 and 261; Art 118, 120, and 123. 3 hours.
263. **Interior Design Studio--Materials and Processes.** Characteristics, manufacturing processes, and application of materials as related to interior design; laboratory-discussion. Prerequisite: Interior Design 161 or consent of instructor. 3 hours.
291. **Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
292. **Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
360. **Interior Design Studio: Residential Environments.** Analysis, synthesis, and design execution of various types of residential interior space, including single family dwellings, multihousing, mobile homes, industrialized housing, and other types of housing. Prerequisite: Interior Design 262 or consent of instructor. 3 hours, or 3/4 or 1 unit.
361. **Development and Function of Family Housing.** Same as Agricultural Mechanization and Family and Consumer Economics 361. See Agricultural Mechanization 361.
378. **Problems in Interior Design.** Individual investigations and reports of specific problems in the field of interior design. Prerequisite: Interior Design 262; senior standing; consent of instructor. 3 hours, or 3/4 or 1 unit

Textiles and Clothing

182. **Clothing Laboratory: Basic Construction.** Fundamental principles of clothing construction; developmental work with pattern, fabric, and equipment as related to fit, design, fabric, and garment assembly. For students with little or no formal experience in clothing construction. 3 hours.
183. **Consumer Textiles.** Introductory analysis and study of textile fibers, yarns, fabrications, finishes, and regulatory legislation; designed to improve consumer competence in selection, use, and care of textile products. Lecture and laboratory. Prerequisite: Chemistry 100 or exemption. 3 hours.
184. **Apparel Design and Selection.** Theory and practice in applying art principles and symbolism in dress to design and selection of apparel. Prerequisite: Art 185 or consent of instructor. 2 hours.
186. **Clothing Laboratory: Tailoring.** Comparisons of tailoring techniques in the construction of garments; comparison of standard construction and tailoring

- techniques appropriate to design and fabric. Prerequisite: Textiles and Clothing 182, or 4-H, or high school clothing construction course, or consent of instructor. 3 hours.
194. **Primary Structures in Weaving.** Exploration of basic elements in weaving and related processes; focus on primitive, traditional, and experimental methods of forming cloth. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
250. **Retailing Internship.** A supervised on- or off-campus experience in retailing through a cooperative program with selected companies. Prerequisite: Textiles and Clothing 280 or 281; Business Administration 202, junior standing, and consent of instructor. 4 hours.
280. **Textiles for Interiors.** Development of criteria for selection of household textiles; introduction to techniques, interpretation, and uses of textile testing; and investigation of contemporary concerns in the household textiles market. Lecture and laboratory. Prerequisite: Textiles and Clothing 183 and Chemistry 101. 3 hours.
281. **Non-Textile Accessories.** Consumer analysis of accessory items of leather, fur, plastic, metal, glass, and china; includes technological, ecological, economic, and legislative aspects; and develops analytical skills in evaluating quality. Lecture and laboratory. Prerequisite: Textiles and Clothing 183 or consent of instructor. 3 hours.
284. **Costume Design.** Creative clothing design using art principles through the media of sketch and color; designing clothing suited to figure type and personality; and understanding the influence of design on contemporary clothing. Prerequisite: Art 120 or 186; Textiles and Clothing 184. 2 hours.
285. **History of Costume.** Costumes and their settings from the early Egyptian period through the middle of the twentieth century. 3 hours.
286. **Clothing Design: Flat Pattern.** Designing by drafting patterns using sources of design inspiration appropriate for this process; fitting a basic pattern to use in designing and making two garments. Prerequisite: Art 120 or 186; Textiles and Clothing 182 or 186; Textiles and Clothing 183 and 184. 3 hours.
287. **Dress and Human Behavior.** Application of selected principles from the behavioral sciences to the analysis of dress as a form of human behavior; includes relevant historical and contemporary theory and research. Lecture-discussion. Prerequisite: Sociology 100, Psychology 100 or 103, Economics 101, and Textiles and Clothing 183 and 184; or consent of instructor. 3 hours.
291. **Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
292. **Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
294. **Advanced Weaving.** Exploration of traditional and experimental methods of developing fabrics by means of the floor loom. Prerequisite: Textiles and Clothing 194. 3 hours.
295. **Textiles and Apparel Marketing.** History of the development of fiber, fabric, apparel, and related industries; present organization, operation, and interrelationships of these industries; trends of the major sectors of the primary and secondary markets; and application of the principles of marketing to fashion merchandise. Prerequisite: Business Administration 202. 3 hours.
296. **Administrative Retailing.** Analysis of functions in a retail store with emphasis on fashion merchandise; relationship of the retailer to related primary and secondary markets and the consumer; and analysis of current trends and social influences in fashion retailing. Prerequisite: Business Administration 212. 3 hours.
380. **Advanced Textiles.** Effects of the physical and chemical structures of textile fibers on their properties, manufacturing processes, use, and care; lecture and laboratory. Prerequisite: Textiles and Clothing 183; Chemistry 101 and either Chemistry 102 or 103 and their appropriate laboratories. 4 hours or 1 unit.
386. **Clothing Design: Draping.** Designing by draping inspired by appropriate design sources; understanding of fitting principles through fabric manipulation; and design effects maintained in garment construction. Prerequisite: Textiles and Clothing 285 or consent of instructor; Textiles and Clothing 286. 4 hours or 1 unit.

388. **Problems in Textiles and Clothing.** Individual problems in the field of textiles and clothing, retailing of clothing, or weaving. Prerequisite: Textiles and Clothing 286, 294, or 380, or Business Administration 212; minimum grade-point average of 3.5; senior standing; consent of instructor. 2 to 4 hours, or 1/2 to 1 unit.
395. **Concepts and Cases in Retailing.** An overview of consumer behavior as related to textiles and apparel; interrelationships of foreign and domestic textile and apparel markets; current research in retailing; and analysis of fashion marketing and retailing issues through the case study method. Prerequisite: Business Administration 212. 3 hours or 1/2 unit.
480. **Seminar in Textiles.** Current literature related to development in the production, use, and care of textile fabrics. Prerequisite: Textiles and Clothing 380 or equivalent; consent of instructor. 1/2 or 1 unit.
487. **Seminar in Clothing.** Study and discussion of theories and research in clothing from the aspects of sociological, economic, communication, and psychological factors contributing to the rise of fashion in dress and the effect of clothing on individuals and groups. Prerequisite: Undergraduate curriculum with majors in textiles and clothing, home economics education, home economics extension, or general home economics. 1/2 or 1 unit.
493. **Advanced Studies in Textiles and Clothing.** Library or experimental research on specific problems of limited scope. May be taken in addition to 8 units required for a master's degree by students who do not write a thesis. 1/2 or 1 unit.
499. **Thesis Research.** 0 to 4 units

THEATRE

Head of Department: Professor B. M. Hobgood

Department Office: 4-122 Krannert Center for the Performing Arts, 602 South Goodwin, Urbana

100. **Practicum, I.** Laboratory in acting, directing, playwriting, theatre management, and in the design, construction, and handling of scenery, lighting, sound properties, costumes, and makeup for public performance. Prerequisite: Consent of instructor for nontheatre majors. 1 to 3 hours. May be repeated for three semesters.
106. **Basic Theatre Practice, I.** Introduction to theatre as a profession; includes theatre operation in Krannert Center for the Performing Arts and the basic skills and concepts of theatre design and technology and theatre performance. Concurrent enrollment in Theatre 108 required. Limited to theatre majors. 6 hours.
107. **Basic Theatre Practice, II.** Introduction to basic skills and concepts of theatre design/technology and performance; further exploration of theatre as a profession and of acting, design, lighting, and make-up. Prerequisite: Theatre 106 and concurrent registration in Theatre 108. 6 hours.
108. **Basic Theatre Practice Laboratory.** Practical experience in two of the following four areas: scenery and props construction and crew, costume construction and crew, lighting crew, and performance workshop. Prerequisite: Concurrent enrollment in either Theatre 106 or 107. Limited to theatre majors. 2 hours. May be repeated once.
109. **Dramatic Form and Content.** Introduces elements of dramatic form and structure through intensive study of selected plays and major critical works. 3 hours.
110. **Literature of the Modern Theatre.** Introduction to realistic drama and its mutations as the dominant bases for twentieth-century theatre practice. Prerequisite: Theatre 109. 3 hours.
120. **Elements of Stagecraft.** Same as Speech Communication 157. The design of stage scenery; the materials and methods of stage scenery construction and stage lighting; and lectures, readings, and practical problems. Not open to theatre majors. 4 hours.

142. **Stage Makeup.** Principles, materials, and application techniques for two- and three-dimensional makeup; lecture, demonstration, and intensive practice. Prerequisite: Theatre 107 or consent of instructor. 2 hours.
151. **Acting Studio, I.** Intensive use of improvisation as a tool for the exploration and communication of experience through speech and action; basic physical training for expressive body use; and fundamentals of voice and speech production. Prerequisite: Theatre 107 and sophomore standing in acting. 8 hours.
152. **Acting Studio, II.** Emphasizes analysis of roles, characterization, and application of skills learned through improvisation to scripted modern plays; continued voice and movement training. A performance is given at the end of the semester. Prerequisite: Theatre 151. 8 hours.
170. **Fundamentals of Acting.** Same as Speech Communication 161. Study of the methods of acting, with emphasis given to the basic stage techniques; the role of the character in relation to the play as a whole; and the intellectual and emotional values of the play and their interpretations by means of voice and action. 3 hours.
175. **Improvisation in Acting.** Improvisation as a tool for the exploration and communication of experience through speech and action on the stage. Prerequisite: Theatre 107 or 170. 4 hours.
176. **Relationships in Acting.** Behavior in stage performance explored on the basis of the actor's relationship with self, with objects, and with other players. Prerequisite: Theatre 175, equivalent stage experience, or consent of instructor. 4 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
223. **Scenographic Techniques, I.** Studio course which applies in programmed sequence the various techniques and processes necessary to stage dramatic productions in the contemporary theatre; focuses on basic drafting, scene shop organization, equipment, and processes. Prerequisite: Theatre 107 or consent of instructor. 4 hours.
224. **Scenographic Techniques, II.** Studio course which continues sequence of techniques and processes necessary to stage dramatic productions in the contemporary theatre; focuses on scene painting techniques, paper and plastics as used on the stage, costume materials, patterning, and basic stage photography. Prerequisite: Theatre 223. 4 hours.
225. **Design Studio, I.** Studio course in basic production design for the stage; includes scenery, costumes, lighting, and properties. Prerequisite: Theatre 224. 6 hours.
226. **Design Studio, II.** Continuation of Theatre 225. Prerequisite: Theatre 225. 6 hours.
227. **Design Studio, III.** Professional studio course for student designers specializing in stage scenery, lighting, or costume design. Prerequisite: Theatre 226. 6 hours.
228. **Design Studio, IV.** Continuation of Theatre 227. Prerequisite: Theatre 227. 6 hours.
229. **Stage Rendering.** Examines sketching and rendering problems for stage designers: stage perspective, fabric rendering, period silhouette, and figure analysis. Open to Professional Studio in Design or Applied Theatre curriculum. Prerequisite: Consent of instructor. 2 hours.
230. **Technical Direction.** Studies mechanical drawing for the theatre, production organization, and technical direction. Prerequisite: Theatre 229 or equivalent; or consent of instructor. 2 hours.
231. **Stage Lighting Practice.** A studio course analyzing current lighting practices and equipment by means of production oriented assignments. Prerequisite: Theatre 107 or consent of instructor. 3 hours.
253. **Acting Studio, III.** Development of actors' skills for musical theatre through study of dance for actors, continued vocal training emphasizing singing, and analysis of British and American musical materials. Prerequisite: Theatre 152. 8 hours.
254. **Acting Studio, IV.** Acting in twentieth-century plays; includes concentrated training in American and foreign dialects and development of movement skills through mime, fencing, and unarmed combat. Prerequisite: Theatre 253. 8 hours.

255. **Acting Studio, V.** Emphasizes acting in period plays. Specialized movement training includes fencing and mime; speech classes stress poetry and interpretation of the classics. Scenes selected from Elizabethan, Restoration, and eighteenth and nineteenth-century plays. Prerequisite: Theatre 254. 8 hours.
256. **Acting Studio, VI.** Study of the techniques of acting for the camera; scenes are recorded on audiovisual tape; and includes such special topics as speech for the microphone and unarmed combat for the camera. Prerequisite: Theatre 255. 8 hours.
263. **Theatre of the Black Experience.** An aesthetic approach to the study of Afro-American drama concerned with the principles, playwrights, movements, and media of black drama since 1960. Prerequisite: Consent of instructor. 3 hours.
280. **Playwriting, I.** A study of the basic structure of the drama. Classwork includes lecture and continuous analysis of weekly writing exercises, focusing on exposition, economy, diction, structural devices, and dramatic action. Term project is a one-act play. Prerequisite: Consent of instructor. 3 hours.
281. **Directing: Script Preparation.** Same as Speech Communication 255. Methods of script analysis and the development of production concepts; explorative projects culminate in the reading of a script for rehearsal. Prerequisite: Theatre 273 and 274, Theatre 152, or Theatre 170. 3 hours.
291. **Individual Topics.** Individual projects and problems. Prerequisite: Consent of instructor. 2 hours.
292. **Individual Topics.** Individual projects and problems. Prerequisite: Consent of instructor. 2 hours.
300. **Practicum, II.** Advanced laboratory in acting, directing, playwriting, and theatre management; the design, construction, and handling of scenery, lighting sound, properties, costumes, and makeup for public performance. Prerequisite: For nontheatre majors, consent of instructor. 1 to 3 hours, or 1/4 to 1/2 unit. May be repeated to a total of 12 hours or 2 units.
310. **Theatre Planning and Programming.** Studies recent theatre architecture and theatre renovations, examining the programming process, the stage forms, the merits of various stage technological systems, and the related business, audience and production facilities of a theatre center. 3 hours or 1 unit.
321. **Design for Directors.** Concepts in production design for the theatre director and exploration of theory through projects. Prerequisite: Theatre 107 or consent of instructor. 3 hours or 1 unit.
322. **Projects in Design for the Theatre.** Practice in the art and craft of stage design. Prerequisite: Theatre 321 or consent of instructor. 3 hours or 1 unit.
330. **Photo-Projection Techniques.** Integration of film techniques with the scenic environment for modern staging, including initial rendering, film processing, projection surfaces, and stage projection equipment. Prerequisite: Theatre 231. 2 hours or 1/2 unit.
331. **Sound for the Theatre.** Introduction to sound reproduction, recording, and basic systems design for theatre. 3 hours or 1/2 unit.
332. **Stage Management.** Principles and craft of stage management. Prerequisite: Junior standing in theatre or consent of instructor. 4 hours or 1 unit.
342. **Costume Patterning.** Draping and drafting patterns for period costumes. 3 hours or 1 unit.
345. **Costume History for the Stage, I.** Surveys theatrical costume and fashion of major periods; emphasizes relationships to styles of art and dramaturgy, social milieu, and production design. Prerequisite: Theatre 223 and 224, or 415, or equivalent. 4 hours or 1 unit.
346. **Costume History for the Stage, II.** Continuation of Theatre 345. Prerequisite: Theatre 345 or equivalent. 4 hours or 1 unit.
353. **Creative Dramatics for Children.** Study of the subject matter and techniques of creative dramatics for children with laboratory application. Prerequisite: Consent of instructor. 3 hours, or 1/2 or 1 unit.

354. **Theatre for the Child Audience.** Study of the history, objectives, and techniques of play production for the child audience; laboratory application. Prerequisite: Consent of instructor. 3 hours, or 1/2 or 1 unit.
355. **The History and Development of the American Musical Theatre.** Surveys the American Musical from early minstrel show and operetta origins to current unique theatrical form. Offered in summer session only for five weeks duration. Prerequisite: Junior standing or above. 3 hours or 3/4 or 1 unit.
361. **Development of Theatrical Forms, I.** History of the drama and theatre of ancient Greece and Rome, the Middle Ages, and the Italian and English Renaissance. Prerequisite: One year of college dramatic literature and junior standing, or consent of instructor. 4 hours or 1 unit.
362. **Development of Theatrical Forms, II.** History of the drama and theatre of the Spanish Renaissance, seventeenth-century France, the English Restoration, the eighteenth and nineteenth centuries in Europe and America, and the Orient. Prerequisite: Theatre 361 or equivalent and consent of instructor. 4 hours or 1 unit.
371. **Contemporary Theatrical Forms.** Study of post-World War I theatre, including the New Stagecraft, expressionism, Brecht and epic theatre, theatre of the absurd, and later developments. Prerequisite: One year of college dramatic literature and junior standing, or consent of instructor. 3 hours or 1 unit.
372. **Introduction to Theatre Management.** Introduction to the basic practices of theatre management, including those in professional, educational, and community theatre. 3 hours or 1 unit.
375. **Acting the Period Play.** Practice in acting, including movement and dialects, appropriate to Elizabethan, Restoration, eighteenth-century, or nineteenth-century plays. Prerequisite: Consent of instructor. 3 hours or 1/2 unit. May be repeated to a maximum of 12 hours or 2 units.
380. **Playwriting II.** Independent study in playwriting; application of principles of dramatic form and structure to the more complex problems of developing a sustained dramatic work. Prerequisite: Theatre 280 and consent of instructor. 3 hours or 1/2 unit. May be repeated to a maximum of 6 hours or 1 unit.
381. **Directing; Rehearsal.** Exploration of methods for directing actors and conducting rehearsals; rehearsal and presentation of a one-act play. Prerequisite: Theatre 281 and consent of instructor. Reading and research in current directing principles and practices required of graduate students. 3 hours or 1 unit.
385. **Preparation for Auditions.** Each actor, through extensive research, prepares a portfolio of audition pieces for the opportunities imminent before and after graduation for resident companies, commercial productions, and film, or professional graduate schools. Prerequisite: Theatre 151, 152, 253, and 254; or consent of instructor. 2 hours or 1/2 unit.
390. **Professional Internship.** Professional employment with an approved host institution in an area related to the student's academic program; exposure to professional situations in which the commercial theatre operates. Full documentation of internship activities required. Prerequisite: Senior or graduate standing in theatre; consent of Internship Coordinator. 0 to 14 hours, or 0 to 3 units.
401. **Studies in Dramatic Form and Structure.** Same as Speech Communication 400. Studies in the relationship of dramatic form and structure to the contemporary production of historical and modern plays. Prerequisite: Consent of instructor. 1 unit.
402. **Studies in Theatre History: Beginnings to the Seventeenth Century.** Examines selected movements and contributors to the theatre from ancient Greece to the age of Louis XIV. Prerequisite: Theatre 361 or consent of instructor. 1 unit. May be repeated to a maximum of 2 units with consent of instructor.
403. **Studies in Theatre History: Seventeenth Century to 1900.** Examines selected movements and contributors to the theatre from the English Restoration to the nineteenth century. Prerequisite: Theatre 362 or consent of instructor. 1 unit. May be repeated to a maximum of 2 units with consent of instructor.
404. **Studies in Theatre History: Twentieth Century.** Examines selected movements and contributors to the theatre from the late nineteenth-century to the contemporary

- period. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units with consent of instructor.
405. **Seminar in the Stage History of Classic English Plays.** Same as English and Speech Communication 469. See English 469.
406. **Seminar in Theatre History.** Same as Speech Communication 468. Studies in the history of the theatre. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 4 units.
407. **Seminar in Theatre Art.** Same as Speech Communication 465. Studies in the aesthetics of the theatre. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 4 units.
411. **Colloquium in Advanced Design and Theatre Technology.** Projects in design for the theatre or in theatre technology, including stage scenery, costuming, lighting, makeup, projections, and sound and stage systems. Prerequisite: Candidacy for M.F.A. in theatre with design and technology specialty, or consent of instructor. 1 or 2 units. May be repeated to a maximum of 8 units.
412. **Studio in Theatre Production, I: Concepts and Their Exploration.** Open to students from the several specialties in theatre who are combined into ensembles to investigate and develop methods for analysis, visualization, and primary rehearsals. Prerequisite: Candidacy for M.F.A. in theatre, or consent of instructor. 2 units. May be repeated to a maximum of 4 units.
413. **Studio in Theatre Production, II: Rehearsal and Performance.** Open to students from the several specialties in theatre who are combined into ensembles in order to produce one or more theatrical productions. Prerequisite: Candidacy for M.F.A. in theatre, or consent of instructor. 2 units. May be repeated to a maximum of 4 units.
415. **Proseminar in Theatre Practice.** Review of contemporary theatre practice in the United States and western Europe, survey of methods in production research, and advanced instruction in theatre specialties. A diagnostic procedure is employed which culminates in the presentation of student projects to a faculty jury. Prerequisite: Admission to graduate study in theatre. 1 or 2 units.
455. **Advanced Theatre Management.** Advanced seminar and practical experience in theatre management; case studies of professional and educational theatre organizations, professional booking, labor relations, and fund raising; and internship in a variety of business operations, including ticket office, promotion, house management, and accounting. Prerequisite: Theatre 372. 1 unit.
471. **Colloquium in Acting.** Performance assignments in productions prepared at Krannert Center, combined with individual evaluation by the acting staff; special acting workshops dealing with problems relevant to the semester's production schedule. Prerequisite: Candidacy for M.F.A. in theatre with acting specialty, or consent of instructor. 1 or 2 units. May be repeated to a maximum of 8 units.
475. **Costume Design for Dance.** Same as Dance 475. Theoretical and practical aspects of costume design and construction for dance, including fabric, renderings, pattern execution and design, and construction and craft techniques; culminates in a practical project involving the design and execution of costumes for a dance production. Prerequisite: For theatre majors, Theatre 346; for dance majors, Dance 375 and 465, and structural completion of the Dance 498 project. 1 unit.
481. **Colloquium in Directing.** Individual assignments in directing, stage managing, or coaching of actors carried out in conjunction with the semester's productions; prepared at Krannert Center or in conjunction with the training of actors in the undergraduate curriculum. Prerequisite: Candidacy for M.F.A. in theatre with directing specialty, or consent of instructor. 1 or 2 units. May be repeated to a maximum of 8 units.
491. **Special Problems.** Individual research in selected topics by arrangement with the instructor. 1/2 to 2 units.
495. **Creative Project.** Open to M.F.A. candidates in theatre only. 1 to 2 units.
499. **Thesis Research.** 0 to 4 units

THEORETICAL AND APPLIED MECHANICS

Head of Department: Professor R. T. Shield

Department Office: 212 Talbot Laboratory, 104 S. Wright, Urbana

NOTE: Credit is allowed for only one of Theoretical and Applied Mechanics 150, 152, 154, or 156. Credit is not allowed for both Theoretical and Applied Mechanics 212 and either Theoretical and Applied Mechanics 154 or 156.

150. **Analytical Mechanics (Statics).** Resultants of force systems; algebraic and graphical conditions of equilibrium of force systems; analysis of forces acting on members of trusses, frames, etc.; forces due to friction; and centroids. Prerequisite: Physics 101 or 106; concurrent registration in Mathematics 240, 241, or 245. 2 hours.
152. **Engineering Mechanics, I (Statics).** Analysis of force systems by means of vector algebra; treatment of two- and three- dimensional systems, including force fields; and introduction of the principle of virtual work. Prerequisite: Physics 106; concurrent registration in Mathematics 240, 241, or 245. 3 hours.
154. **Analytical Mechanics (Statics and Dynamics).** A combination of Theoretical and Applied Mechanics 150 and 212 with less emphasis on some topics. Prerequisite: Physics 101 or 106; concurrent registration in Mathematics 240, 241, or 245. 4 hours.
156. **Analytical Mechanics (Statics and Dynamics).** A combination of Theoretical and Applied Mechanics 150 and 212. Prerequisite: Physics 101 or 106; concurrent registration in Mathematics 240, 241, or 245. 5 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
212. **Engineering Mechanics, II (Dynamics).** Introduces the elements of vector calculus as applied to mechanics; treats the kinematics of three-dimensional motion of a particle and of a rigid body; considers motion relative to translating and rotating reference frames; and treats the kinetics of particles and rigid bodies by using principles involving force, mass, and acceleration, work and energy, and impulse and momentum. Prerequisite: Theoretical and Applied Mechanics 150 or equivalent; Mathematics 240, 241, or 245. 3 hours.
221. **Elementary Mechanics of Deformable Bodies.** Elastic and inelastic relationships between external forces (loads) acting on deformable bodies and the stresses and deformations produced; tension and compression members; members subjected to torsion and to bending; buckling (columns); combined stresses; repeated loads (fatigue); energy loads and impact; and influence of properties of materials. Prerequisite: Theoretical and Applied Mechanics 150 or equivalent; Mathematics 240, 241, or 245. 3 hours.
223. **Mechanical Behavior of Solids.** Influence of loading conditions and environment on the behavior of engineering materials; effects of rate of loading, time, temperature, number of stress cycles, and state of stress on the ductile and brittle behavior of materials; and significance of mechanical properties. Prerequisite: Concurrent registration in Theoretical and Applied Mechanics 221. 1 hour.
224. **Behavior of Materials.** Introduction to atomic and molecular structure of metals, cement, concrete, plastics, ceramics, and glass; response of these materials to rapid, steady, and repeated loads at various temperatures (and environments) in terms of rheological models; and fracture behavior of specific materials, that is, stress rupture, brittle fracture, and fatigue of metals and concrete. Prerequisite: Theoretical and Applied Mechanics 221. 3 hours.
235. **Fluid Mechanics.** Fluid properties and statics; fluid flow; ideal and real fluids; similitudes; laminar and turbulent flow in closed conduits; boundary layers; free surface flow; and turbo-machinery. Prerequisite: Theoretical and Applied Mechanics 212. 4 hours.
293. **Research and Design Project.** With guidance from a faculty member, each student formulates an applied mechanics research and design project to be completed in

- Theoretical and Applied Mechanics 294. Experience in research and development aspects of engineering design is gained by means of mathematical modelling, numerical analysis, and laboratory experimentation. Prerequisite: Senior standing in engineering mechanics. 2 hours.
294. **Research and Design Project.** The Department's research and design facilities are made available to each student to carry out, under faculty supervision, the project formulated in Theoretical and Applied Mechanics 293. Each student prepares a technical report or paper and presents the results orally. The best papers are presented at a symposium held at the end of the semester, bound together and published as a Theoretical and Applied Mechanics Report. Prerequisite: Theoretical and Applied Mechanics 293. 4 hours.
299. **Thesis.** Thesis investigation of special subjects including theoretical and/or experimental research. Prerequisite: Senior standing; approval of head of department. 3 hours.
311. **Vibrations of Mechanical Systems, I.** Examines theory and application of free and forced vibrations of single and multiple degree of freedom discrete linear systems; studies matrix methods, including the algebraic eigenvalue problem; Lagrange's equations; damping; modal analysis; shock spectra; and introduction to random vibrations. Prerequisite: Theoretical and Applied Mechanics 154, 156, or 212; and Math 341 or 345. 3 hours or 3/4 unit. Credit is not given for both Theoretical and Applied Mechanics 311 and Civil Engineering 374.
314. **Advanced Dynamics for Engineers.** Newtonian mechanics of a system of particles; Lagrangian mechanics of a dynamical system; the kinematics and dynamics of a rigid body; and engineering applications. Prerequisite: Theoretical and Applied Mechanics 212 or equivalent; Mathematics 345 or equivalent, and credit or concurrent registration in Mathematics 343. 3 hours or 3/4 unit.
321. **Advanced Mechanics of Deformable Bodies.** Basic concepts of mechanics of deformable bodies and brief review of elementary topics; theory of stress and strain at a point; theories of failure; including failure by fracture; unsymmetrical bending; curved beams; torsion of noncircular sections; energy principles; and Castigliano's theorem. Prerequisite: Theoretical and Applied Mechanics 221. 3 hours or 3/4 unit.
324. **Flow and Fracture of Structural Metals.** Fundamental concepts of strength of crystalline engineering materials at atomic, single crystal, and polycrystalline levels of association in relation to engineering mechanisms of failure; functional relationship between material variables, state of stress, strain, time, temperature, and failure of engineering components by creep, stress rupture fatigue, and brittle fracture. Prerequisite: Theoretical and Applied Mechanics 221 or consent of instructor. 3 hours or 3/4 unit.
326. **Experimental Stress Analysis.** Measurement of stresses or deformations that are of significance in the engineering design of load resisting members; use of optical, electrical, and mechanical instrumentation, models, analogies, brittle coatings, electrical resistance gauges, photoelasticity, etc. Prerequisite: Theoretical and Applied Mechanics 221 or equivalent. 3 hours or 3/4 unit.
334. **Fluid Mechanics and Advanced Hydraulics.** Study of the basic properties of fluids in general, particularly those that influence the flow of fluids in pipes and open channels; viscosimetry; dimensional analysis; effects of boundary conditions; cavitation; water tunnel; hydraulic jump; water hammer pumps; and turbines. Some laboratory work. Prerequisite: Theoretical and Applied Mechanics 235. 3 hours or 3/4 unit.
335. **Dynamics of Fluids.** An intermediate course in the mechanics of fluids introducing analytical methods of solution for ideal and real fluids; potential flow theory, theoretical approaches to viscous flows including boundary layer theory, and the analysis of compressible flows are indicated. Prerequisite: Theoretical and Applied Mechanics 235. 3 hours or 3/4 unit.
351. **Fundamental Concepts of Deformable Body Mechanics.** Introduction to the general theories of kinematics of deformable bodies; general balance laws applicable to continuum mechanics; constitutive relations (stress-strain relations); and

- introductions to linear elasticity, linear viscoelasticity, and special concepts in other areas of solid mechanics and fluids. Prerequisite: Theoretical and Applied Mechanics 221; Mathematics 343 and 345. 3 hours or 3/4 unit.
360. **Continuum Mechanics, I.** A unified treatment of modern continuum mechanics; linear algebra and analysis, review of kinematics and general balance laws, and general theory of mechanical constitutive equations (simple materials). Prerequisite: Theoretical and Applied Mechanics 351 or equivalent. 3 hours or 3/4 unit.
373. **Fundamentals of Engineering Acoustics.** Same as Electrical Engineering 373. See Electrical Engineering 373.
381. **Mechanical Behavior and Fracture of Noncrystalline Solid Engineering Materials.** Characterization of noncrystalline materials including inorganic glasses, polymers, clay, cement, asphalt, particulate composites, and fibrous composites according to their molecular or microscopic structure and macroscopic mechanical behavior; examination of models of structure that relate to mechanical behavior; treatment of time-dependent behavior using rheological models; discussion of ductile and brittle modes of fracture; and introduction of concepts of fracture mechanics and the statistical theory of fracture strength used to describe fracture strength. Prerequisite: Theoretical and Applied Mechanics 224 or equivalent; consent of instructor. 3 hours or 3/4 unit.
392. **Design and Analysis in Engineering Practice.** Examples of design problems which occur in engineering practice and the procedures which are used to solve them; emphasis on establishing the relationship between the sophistication of analysis and the level and nature of the design process. Considerable use is made of the case study approach and students are expected to execute a number of tasks at different design levels. Prerequisite: Consent of instructor. 3 hours or 3/4 unit.
393. **Independent Study.** Individual studies in any area of theoretical and applied mechanics. 1 to 8 hours, or 1/4 to 2 units.
400. **Seminar in Engineering Mechanics.** Treatment of special topics in the field of mechanics including mechanics of solids problems such as fracture of metals and creep of materials; fluid flow problems such as the nature of turbulence, boundary layer theory, nature and effects of roughness of boundary, and effects of free surface; dynamics problems such as vibration of beams with moving loads and the gyroscope; and certain other topics, such as biomechanics, that cut across all areas of mechanics. Each semester one or more of these topics is selected and announced as the area to be covered. 0 to 1/4 unit.
412. **Vibrations of Mechanical Systems, II.** Examines problems in the vibration of continuous linear elastic structures, including strings, rods, beams, membranes, and plates; Hamilton's principle; solution by separation of variables, integral equation and transform methods; variational methods of approximation including the finite element method; and computational methods. Prerequisite: Theoretical and Applied Mechanics 311 or Civil Engineering 374; Theoretical and Applied Mechanics 314 or equivalent. 1 unit.
416. **Energy Principles in Engineering Mechanics.** Introduction to the variational principles of mechanics and their applications to engineering problems; the derivation, interpretation, and applications of the principle of virtual displacements, the principle of minimum potential energy, and the principle of complementary energy; major emphasis on Castigliano's theorem, Hamilton's principle, and Lagrange's equations of motion; brief treatment of variational methods of approximation; and numerous illustrative applications to stress analysis of statically determinate and statically indeterminate frames, problems of elastic stability, the theories of rings and curved beams, the theory of elastic plates, vibrations of structures, and wave motions. Prerequisite: Theoretical and Applied Mechanics 451. 1 unit.
417. **Stochastic Structural Dynamics.** Same as Aeronautical and Astronautical Engineering 452. See Aeronautical and Astronautical Engineering 452.
418. **Aerodynamic Noise.** Same as Aeronautical and Astronautical Engineering 453. See Aeronautical and Astronautical Engineering 453.

- 424. Properties of Engineering Materials.** Structure of metals and behavior of materials under various conditions of loading and use, including static, creep, fatigue, and impact; effects of high and low temperature, strain rate, state of stress, and internal structure; criteria of failure; relation of mechanical properties to behavior; significance of mechanical properties; tests and interpretation of test data; and material specifications. 1 unit.
- 428. Analysis of Nonlinear Systems.** Same as Electrical Engineering 428. See Electrical Engineering 428.
- 429. Theory of Linear and Nonlinear Viscoelasticity.** Same as Aeronautical and Astronautical Engineering 429. See Aeronautical and Astronautical Engineering 429.
- 431. Theory of Ideal Fluid Flow.** Together with Theoretical and Applied Mechanics 432, covers topics in advanced fluid mechanics that are the basis of many modern developments. Ideal fluid theory is concerned with an incompressible fluid of negligible viscosity. The differential equations of motions are derived and the several methods of obtaining flow solutions are presented: the obtaining of velocity potentials and stream functions by superposition of the effects of source, doublets, and vortices, and by the methods of conformal mapping. Relations for finding the resultant forces and moments on bodies are derived and applied to bodies such as lifting surfaces. Other topics include the theory and application of free streamline flows, vortex motions, and surface wave theory. Prerequisite: An elementary course in fluid flow; a course in advanced calculus. 1 unit.
- 432. Theory of Flow of Viscous Fluids.** Although a logical continuation of Theoretical and Applied Mechanics 431, this course need not be taken sequentially. The theoretical development, analysis, and solution of incompressible viscous fluid flow problems; derivation of the differential equations of motion, starting with the stress relations occurring in viscous fluids; development of direct and approximate solutions for laminar flows; presentation of boundary-layer theory; introduction to the occurrence of turbulence and its characterization; the basic equations for analyzing turbulent flows; presentation of approximate solution for flows in boundary-layers with and without pressure gradients (and separation) pipes and jets; and consideration of experimental observation and application to technological problems. Prerequisite: An elementary course in fluid flow; a course in differential equations. 1 unit.
- 438. Turbulence.** Starting with the statistical modes of characterizing turbulence, discussion covers statistical theory, energy considerations, and nature of turbulence in typical flows. Laboratory experiments are used to illustrate hot wire technique of turbulence measurements and the structure of turbulence. Prerequisite: Theoretical and Applied Mechanics 432 or equivalent. 1 unit.
- 441. Applied Analysis in Engineering.** Provides training in applications of mathematics to engineering problems; most of the illustrations taken from engineering mechanics. Prerequisite: Mathematics 241; Mathematics 343 and 345 recommended. 1 unit.
- 442. Applied Analysis in Engineering.** Continuation of Theoretical and Applied Mechanics 441. Prerequisite: Mathematics 241; Mathematics 343 and 345 recommended. 1 unit.
- 451. Theory of Elasticity with Application to Engineering Problems.** Study of the mechanics of elastic deformable bodies, based on the fundamental concepts of equilibrium, geometry of strain, and properties of materials; detailed study of relations between stresses, strains, and displacements; and special consideration given to their significance in engineering problems. Prerequisite: Theoretical and Applied Mechanics 221; Mathematics 343; Mathematics 341 or equivalent. 1 unit.
- 452. Theory of Elasticity with Application to Engineering Problems.** Continuation of Theoretical and Applied Mechanics 451. Prerequisite: Theoretical and Applied Mechanics 451. 1 unit.
- 454. Theory of Shells.** Provides the theoretical basis of stress analysis of shell-type structures, such as ships, submarines, monocoque aircraft structures, concrete roofs

and domes, pressure vessels, and containers for liquids; includes the differential geometry of shell theory, equilibrium equations, momentless theory of shells, strains in shells, statically indeterminate problems of shells, energy formulations, and stability of shells. Prerequisite: Theoretical and Applied Mechanics 451. 1 unit.

457. **Classical Elastostatics.** A modern unified treatment of the concepts and techniques developed by investigating the Cauchy- Navier equations; emphasis on the interpretation and motivation of ideas and their interrelation for the solution of three-dimensional problems; and topics including the classical boundary-value problems, existence and uniqueness theorems, stress functions and displacement potentials, singular states of stress, extension of Green's method to the equations of elasticity, method of series, and approximation techniques. The course represents a preparation for (1) students interested in the current state of knowledge in classical elasticity, and (2) students intending to do doctoral dissertations in classical elasticity. Prerequisite: Theoretical and Applied Mechanics 451 or equivalent; consent of instructor. 1 unit.
458. **Wave Motion in Continuous Media.** Analysis of the dynamics of deformable bodies with a major emphasis on elastic media; introduction to the terminology associated with and the methods of treating such problems; general discussion of the motion of strings, bars, shafts, plates, and other bodies when subjected to load; detailed examination of approximations involved; and discussion of their engineering significance. Prerequisite: Theoretical and Applied Mechanics 311, 314, and 451; Mathematics 341, 342, or 343, or equivalent. 1 unit.
462. **Theory of Plasticity.** The physical and mathematical formulation of the mechanics of inelastically deformed bodies, plastic stress-strain laws, and their association with yield and loading function; deals primarily with members subjected to biaxial and triaxial stress conditions. Specific topics include applications to flexure and torsion of prismatic members; expansion of thick-walled cylinders and spherical shells; and introduction to problems in plane plastic flow and variational plasticity. Prerequisite: Theoretical and Applied Mechanics 451 or equivalent. 1 unit.
464. **Theory of Buckling.** The pertinent information and theoretical background required for the prediction of failure by buckling of structures such as airplanes, ships, bridge trusses, fabricated towers, and shells; practical illustrations. Specific topics include elastic columns with various end restraints; buckling of framework, arches, rings, and plates; inelastic buckling of columns and plates; lateral buckling of beams; energy theory; Ritz procedure; and Euler's equation of the calculus of variations. Prerequisite: Theoretical and Applied Mechanics 416 and 451. 1 unit.
485. **Fracture Mechanics.** Acquaints students with the analytical and experimental techniques used to solve current fracture problems; topics include a discussion of the macroscopic theories used to determine the static strength of bodies containing cracks; linear elastic fracture mechanics (the tool and the model) and its relation to the Griffith criteria of fracture; elastic-plastic fracture mechanics models: small- scale yielding results and their implications; and an introduction to fracture mechanics in the realm of general yielding. Examples of how the analytical methods can be applied are derived from discussion of the general fracture control plan. Prerequisite: Theoretical and Applied Mechanics 324 and 451, or consent of instructor. 1 unit.
493. **Advanced Independent Study (Special Problems).** Analytical or experimental studies in one or more phases of theoretical and applied mechanics, including mechanics of materials, theory of elasticity, theory of plasticity, properties of materials, mechanical vibrations, hydraulics and fluid mechanics, fatigue of metals, etc. 1/2 to 2 units.
499. **Thesis Research.** 0 to 4 units

UKRAINIAN

(See Slavic Languages and Literatures)

URBAN AND REGIONAL PLANNING

Head of Department: Professor C. V. Patton

Department Office: 1003 West Nevada Street, Urbana

101. **Planning of Cities and Regions.** Survey of city and regional planning as related to problems and programs of urbanization and resource development. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
230. **Introduction to Transportation Engineering and Planning.** Same as Civil Engineering 230. See Civil Engineering 230.
240. **Land Use Planning Process.** Techniques in the preparation of land use plans, including a review of the land use aspects of community facilities and transportation. Prerequisite: Urban Planning 101 or consent of instructor. 3 hours.
247. **Planning Workshop, I.** Field work dealing with selected physical and/or social planning problems. Prerequisite: Consent of instructor. 6 hours.
260. **Urban Social Problems and Planning.** Examines the traditional pattern of social planning decisions and emergent alternatives at the federal, city, and neighborhood levels; includes case studies, field work, and term project. 3 hours.
290. **Planning Internship.** Professionally supervised field experience in public and private planning or development agencies; designed to introduce students to professional employment and actual planning practice. Students work in a department-approved agency of their own choice either during the summer session or part-time during a regular semester. At least two weeks of full-time employment or its equivalent is required for each semester hour of credit. Summary reports are submitted by both employer and student. Prerequisite: Senior standing or consent of instructor. 0 to 6 hours. No more than 8 hours of Urban Planning 290 may be applied toward the Bachelor's degree.
297. **Special Problems.** Special projects, research, and independent reading. Prerequisite: Consent of head of department. 2 to 6 hours.
301. **Development of American Planning Thought.** Planning from the mid-nineteenth century to the present as related to cultural, societal, and philosophical influences. Prerequisite: Consent of instructor. 3 hours, or 3/4 or 1 unit.
302. **Evolution of American Cities.** Examines the process of urban growth and development at the national, metropolitan, and city levels; major efforts to plan the national network and internal form of cities; and the possible uses of historical knowledge in policy formation and planning. Prerequisite: Major standing in urban planning, architecture, landscape architecture, history, or geography, or consent of instructor. 3 hours, or 3/4 or 1 unit.
303. **Urban Structure and Functions.** The concept of urban structure; the elements of urban spatial structure and growth; the human stresses in urban spatial structure; and structural remedies past and present. Prerequisite: Consent of instructor. 3 hours, or 3/4 or 1 unit.
304. **Urban Planning Theory.** Examination of the urban planning function within a theoretical, methodological, institutional, and professional context. Prerequisite: Consent of instructor. 3 hours, or 3/4 or 1 unit.
307. **Managing Urban Development.** Implementation of the planning program through administrative mechanisms, finance, citizen participation, and reorganization; evolution of implementation techniques; status of the local planning agency; and professional approaches to operation and management of the planning agency. Prerequisite: Political Science 150, or 305 and 306, or senior standing in urban and regional planning. 3 hours, or 3/4 or 1 unit.
308. **Law and Planning Implementation.** Cases, legislation, and materials illustrative of the social, economic, and environmental interrelationships of land-use planning and the dynamic role of law as a system of controlled conflict; traditional and emerging concepts of zoning, subdivision regulation, housing codes, and review

- procedures. Prerequisite: Political Science 150, or 305 and 306, or Urban Planning 315, or consent of instructor. 3 hours, or 3/4 or 1 unit.
314. **United States Population and Land Settlement Policy.** Scientific, ethical, constitutional, political, and land use planning aspects of American population policy and issues, including migration and immigration; population distribution and redistribution; and national, regional, and local growth and land use policy. Prerequisite: Consent of instructor. 3 hours, or 3/4 or 1 unit.
315. **Legal Basis of Governmental Planning.** Cases and materials illustrative of legal concepts and institutions basic to the governmental planning process including property, police power, eminent domain, taxation, separation of powers, and due process; indicates both the problems and potential of adaptability by the legal system in response to contemporary socioenvironmental issues. Prerequisite: Consent of instructor. 3 hours, or 3/4 or 1 unit.
316. **Planning Analysis.** Research and analytic techniques in urban planning: economic base and employment; population; market analysis; and derivation and use of statistical data. Prerequisite: Consent of instructor. 3 hours, or 3/4 or 1 unit.
320. **Planning for Historic Preservation.** Survey of the preservation movement in relation to urban planning; techniques for selection of sites and definition of districts; funding, regulation, and implementation measures; and case studies of preservation plans and programs. Prerequisite: Consent of instructor. 3 hours, or 3/4 or 1 unit.
325. **Methods of Preservation Research and Planning.** Techniques of preservation research and planning, including historical research, inventory methods, interpretive methods, neighborhood preservation, financial and legal tools, special problems and issues, and field work. Prerequisite: Urban Planning 320 or consent of instructor. 3 hours, or 3/4 or 1 unit.
326. **Urban Design and Planning Methods.** Concepts and techniques of urban analysis, plan making, and implementation essential for effective interdisciplinary work in urban design; case studies of major types of large-scale projects. Prerequisite: Consent of instructor. 3 hours, or 3/4 or 1 unit.
327. **Preservation Planning Workshop.** Small group field work dealing with application of planning principles and techniques to actual preservation planning problems in a nearby community or area. Prerequisite: Urban Planning 101 or 320, or consent of instructor. 3 to 6 hours, or 3/4 to 1 1/2 units. May be repeated to a maximum of 12 hours or 3 units.
330. **Urban Transportation Planning.** Same as Civil Engineering 330. Role of transportation in urban development and planning; characteristics of urban-person transportation systems and methods of analysis and forecasting of urban-person transportation demand; transportation systems management and capital improvement programming; and emphasis on the needs and activities of metropolitan planning organizations. Prerequisite: Civil Engineering 230, Urban Planning 332, or equivalent. 3 hours, or 3/4 or 1 unit.
331. **Regional Transportation Planning.** Same as Civil Engineering 331. See Civil Engineering 331.
332. **Introduction to Transportation Planning.** Basic concepts and techniques for urban transportation planning. Prerequisite: Consent of instructor. 3 hours, or 3/4 or 1 unit.
338. **Planning Workshop, III.** Small-group field work dealing with actual planning problems at local, regional, state, or national levels; emphasis on production of concrete plans and policies, including strategies for implementation. Student selects from several sections, depending on specific interests. Prerequisite: Consent of instructor. 6 hours or 1 1/2 units.
342. **Seminar on Environmental Policy and Law.** Identification and analysis of environmental issues and legal developments primarily at the state and federal levels. Prerequisite: Consent of instructor. 3 hours, or 3/4 or 1 unit.
343. **Environmental Quality Management.** Same as Environmental Studies 393. See Environmental Studies 393.

346. **Analysis for Urban Environmental Problems and Policies.** Same as Environmental Studies 316. See Environmental Studies 316.
350. **Survey of Regional Planning.** Concepts and procedures for planning of regions; river valley, metropolitan, state, and national planning. Prerequisite: Consent of instructor. 3 hours, or 3/4 or 1 unit.
360. **Introduction to Social Planning.** Survey of the major social policy issues confronting urban areas in the United States today; examination of problems, policies, and programs in several functional areas (education, manpower development, health, welfare, etc.), as well as their interrelationships and their respective contributions to the problems of poverty; and analysis of processes of citizen participation as well as the roles of government in general and the planner in particular. Prerequisite: Consent of instructor. 3 hours, or 3/4 or 1 unit.
366. **Concepts and Techniques of Citizen Participation.** Examines concepts and techniques of citizen participation in relation to planning and public administration. Analyzes alternative approaches at federal, city, and neighborhood levels; decentralization; public information; advocacy planning; community planning; and representational theory and practice. 3 hours, or 3/4 or 1 unit.
394. **Special Topics in Urban and Regional Planning.** Seminar on topics of current interest, as announced in the Timetable. 3 hours, or 3/4 or 1 unit. May be repeated to a maximum of 12 hours or 4 units.
401. **Land Use Planning and Policy Formulation.** Principles and techniques for the preparation of land use, transportation, and community facilities plans; delineation of the comprehensive plan and the policy report; and social and economic implications of land use planning. Prerequisite: Consent of instructor. 1 unit.
405. **Planning Methods.** Applied analytic methods in urban and regional planning, including survey research techniques, population analysis and projection, community economic and employment analysis, land-use and transportation studies, and evaluation techniques. Prerequisite: Urban Planning 316 or equivalent; consent of instructor. 1 unit.
406. **Urban and Regional Analysis.** Same as Geography 406. Economic and demographic analysis of regional growth and change; emphasizes forecasting and impact studies. Topics include data sources, economic base studies, population estimation and projection, economic impact analysis, and employment projection; practical application of methods to a study area. Prerequisite: Introductory statistics such as Sociology 185 or Geography 185 or consent of instructor. 1 unit.
407. **Economic Analysis of Public Plans and Policies.** Techniques of policy analysis and evaluation; includes microeconomic concepts, cost-benefit analysis, cost-effectiveness, and planning-programming-budgeting systems; and examines selected public policies in areas such as transportation, environmental control, health, education, housing, and local finance. Prerequisite: Consent of instructor. 1 unit.
411. **Planning Strategies and Models.** Critical overview of current planning and decision-making models, with particular reference to their application to social problem-solving in urban areas; interaction between the planning process and urban political systems. Prerequisite: Consent of instructor. 1 unit.
414. **Issues in State and Local Public Finance.** Selected topics, such as alternative mechanisms for public resource allocation, sources of funds, the impact of growth on local finances, functions by governmental level, and intergovernmental transfers and revenue sharing. Prerequisite: Urban Planning 407, Economics 300, or consent of instructor. 1 unit.
434. **Urban Transportation Policy.** Major policy elements in urban transportation and the relationship of urban transportation to the region, including the decision-making process, configuration and growth of the metropolitan area, and allocation of resources. 1 unit.
441. **Suburban Land Use Patterns.** Same as Landscape Architecture 441. See Landscape Architecture 441.
445. **Spatial Design Methods.** Same as Landscape Architecture 442. See Landscape Architecture 442.

- 446. Seminar on Land Use Modeling.** The concept of mathematical modeling; usefulness of models in land use and transportation planning; the mathematics of modeling; methods and procedures used in building models of location and allocation of urban land use; the role of movement, economic activity, locational trends, and institutional constraints; model taxonomy, characteristics, applications, and problems; and examination of characteristic modeling efforts. Prerequisite: One course in statistics, one course in microeconomics, and one course in calculus; or consent of instructor. 1 unit.
- 450. Issues in Regional Development.** Same as Geography 450. See Geography 450.
- 456. Regional Science Methods: Economic and Demographic.** Same as Geography 456. Examines models of regional growth and development, including export base, input-output and econometric, cohort component and spatial interaction; emphasizes socioeconomic impact analysis and forecasting subnational economic and demographic change. Prerequisite: Urban Planning 406 or consent of instructor. 1 unit.
- 457. Seminar in Regional Science.** Same as Geography 457. See Geography 457.
- 473. Housing and Urban Policy Planning.** The role of housing in American social policy planning; economic modeling of the housing market, emphasizing supply and demand functions and private market imperfections; and analysis of public policies for housing as they affect special consumer groups, such as the poor, the elderly, and the nonwhite. Prerequisite: Urban Planning 407 or consent of instructor. 1 unit.
- 475. Housing and Urban Planning Analysis.** Housing location and developmental models; housing need and market analysis techniques; survey and appraisal of housing; and case studies of current housing problems and current research priorities. Prerequisite: Urban Planning 407 and 473, and Finance 364 or 469; or consent of instructor. 1 unit.
- 490. Professional Internship.** Summer, part-time, or other professional-level employment in the field of planning, usually in an area of concentration; exposure to the social, political, and institutional setting in which planning operates; and full documentation of internship activities required. Prerequisite: Consent of instructor. 0 credit.
- 494. Seminar.** Selected topics in urban and regional planning; several sections each semester. Prerequisite: Consent of instructor. 1 unit.
- 497. Urban Planning Research.** Independent study in selected urban and regional planning topics. Prerequisite: Consent of instructor and head of the department. 1/4 to 1 unit. No more than 4 units may be applied toward the Master of Urban Planning degree.
- 498. Master's Project.** A major independent or small-group project, conducted in lieu of a master's thesis. Prerequisite: Consent of instructor. 1 unit.
- 499. Thesis Research.** Prerequisite: Graduate standing in urban and regional planning; consent of the head of the department. 0 to 1 1/2 units

VETERINARY BIOSCIENCES

Head of Department: Professor W. C. Wagner

Department Office: 269 Veterinary Medicine Building, 1101 West Peabody, Urbana

- 300. Gross Anatomy.** The systematic and topographic study of the anatomy of the dog by lecture and dissection laboratory. Prerequisite: Registration in the veterinary curriculum or consent of instructor. 4 hours or 1 unit.
- 301. Microscopic Anatomy.** Study of the cytology, histology, and organology of domestic animals by lecture and laboratory. Prerequisite: Registration in the veterinary curriculum or consent of instructor. 6 hours or 1 1/2 unit.

302. **Gross Anatomy.** Study of the systematic and topographic anatomy of the large domestic animals by lecture and dissection laboratory. Prerequisite: Veterinary Biosciences 300 and 301 or consent of instructor. 4 hours or 1 unit.
303. **Integumentary Specializations and Special Senses.** Functional anatomy of the equine hoof and underlying dermal specializations; structural and functional alterations associated with laminitis, navicular disease, conformational defects, and faulty shoeing; brief discussion of claws, horns, and antlers; and functional anatomy of the eye and ear with emphasis on species differences. Prerequisite: Veterinary Biosciences 301 and concurrent registration in Veterinary Biosciences 302. 1 hour.
304. **Applied Anatomy.** Lecture-laboratory course considering the morphology of food and companion animals relative to diagnostic and surgical procedures. Prerequisite: Third-year standing in veterinary curriculum or consent of instructor. 2 hours.
305. **Developmental Anatomy.** Lecture-discussion consideration of the development of organs and systems with emphasis on specialization in domestic and laboratory animals. Prerequisite: Veterinary Biosciences 300 and 301 or consent of instructor. 3 hours or 3/4 unit.
306. **Biomechanics of Quadripedal Locomotion.** Investigates the relationship between the biology and mechanics of the quadripedal locomotor system utilizing the techniques of morphology and mechanical engineering; where appropriate, considers the role of biomechanics in the pathobiology and treatment of orthopedic diseases. Prerequisite: Consent of instructor. 3 hours.
307. **Comparative Primate Anatomy.** Same as Anthropology 308. Lecture discussion, and dissection laboratory comparing the organ systems of old and new world primates to those of a dog. Prerequisite: Veterinary Biosciences 300 or Physiology 234, or equivalent. 2 hours or 1/2 unit.
312. **Histology.** Laboratory-discussion course of the microscopic anatomy of the tissues and organs of domestic animals. Students may elect an additional 2 hours or 1/2 unit of credit in advanced topics of their choice, such as histotechnique, research methods, or histochemistry. Prerequisite: A course in vertebrate biology or consent of instructor. 2 or 4 hours, or 1/2 or 1 unit.
315. **Physiology, I.** Lecture-discussion and laboratories on muscular, nervous, endocrine, and reproductive systems. Prerequisite: First-year standing in the veterinary curriculum or consent of instructor. 5 hours or 1 1/4 units.
316. **Physiology, II.** Lecture-discussion on digestive, cardiovascular, renal, and respiratory systems; body fluids, acid-base, balance, and temperature regulation. Prerequisite: Second-year standing in the veterinary curriculum or consent of instructor. 4 hours or 1 unit.
317. **Physiology-Pharmacology Laboratory.** Laboratory study of physiological processes and the effects of drugs upon these processes. Prerequisite: Second-year standing in veterinary curriculum. 1 hour.
318. **Pharmacology.** General principles of pharmacy and an analysis of the action of chemical agents on physiological processes; lectures, discussions, demonstrations, and laboratory. Prerequisite: Second-year standing in veterinary curriculum or consent of instructor. Required in veterinary curriculum. 4 hours or 1 unit.
319. **Pharmacology, II.** Lecture-discussion on the action of chemical agents on physiological processes and disease-producing organisms. Prerequisite: Veterinary Biosciences 318 or equivalent. 3 hours or 3/4 unit.
320. **Toxicology.** Discusses the mechanisms of action, clinical, diagnostic, and therapeutic aspects of chemical and plant toxicants in domestic animals. Prerequisite: Veterinary Biosciences 319 or equivalent. 2 hours or 1/2 unit.
321. **Advanced Clinical Cardiology.** Lecture-discussion course devoted to veterinary clinical cardiology; discusses various cardiac conditions such as arrhythmias, congenital anomalies, acquired vascular disease, and other common types of acquired cardiac disease from the standpoint of diagnosis, treatment, and management. Prerequisite: Fourth-year standing in veterinary curriculum or consent of instructor. 2 hours.

322. **Veterinary Clinical Pharmacology: The Basis for Rational Therapeutics.** Same as Veterinary Clinical Medicine 322. Lectures designed to assist the student in integrating knowledge of the science of pharmacology with an understanding of veterinary internal medicine; emphasizes the establishment of therapeutic objectives as applied to various body systems. Prerequisite: Fourth-year standing in the veterinary curriculum. 2 hours.
324. **Nutritional Aspects of Large Animal Medicine.** Clinical aspects of nutritional deficiencies, imbalances, and toxicities in cattle, horses, and swine; presentation of therapeutic principles; and nutritional aspects of the etiology, prevention, and treatment of specific disease conditions. Prerequisite: Third-year standing in veterinary curriculum or consent of instructor. 2 hours.
326. **Nutritional Aspects of Small Animal Medicine.** Clinical aspects of nutritional deficiencies, imbalances, and toxicities in small animals; presentation of therapeutic principles; and nutritional aspects of the etiology, prevention, and treatment of specific disease conditions. Prerequisite: Third-year standing in veterinary curriculum or consent of instructor. 1 hour.
327. **Economics and Business Management for the Veterinarian.** Summary of management in a practice of veterinary medicine; emphasizes the application of economic principles to record analysis, personnel management, business organization, and financial management. Prerequisite: Fourth-year standing in veterinary curriculum. 1 hour.
328. **Veterinary Computer-Based Instruction.** Design and evaluation of computer-based instruction for veterinary medicine, using PLATO. Each student develops an instructional sequence for use in a veterinary course, in consultation with a veterinary instructor. Prerequisite: Registration in veterinary curriculum. 2 hours.
367. **Radiology and Radiobiology.** Same as Veterinary Clinical Medicine 367. See Veterinary Clinical Medicine 367.
378. **Veterinary Clinical Orientation.** Same as Veterinary Clinical Medicine and Veterinary Pathobiology 378. See Veterinary Clinical Medicine 378.
392. **Special Problems.** Individual research on a special problem chosen in consultation with the instructor and department head. Prerequisite: Registration in veterinary curriculum with grade- point average of 4.0 or above, or consent of instructor. 1 to 3 hours, or 1/4 to 3/4 unit. May be repeated to a maximum of 6 hours or 1 unit.
405. **Morphology of Reproduction.** Morphology of genital and endocrine organs of reproduction in domestic and laboratory animals, including histochemistry and radioautography; interpretation of illustrations, such as light and electron micrographs, as well as morphometric and stereologic data. Prerequisite: Credit or concurrent registration in Physiology 406. 1/2 unit.
407. **Laboratory Methods in Physiology of Reproduction.** Same as Animal Science and Physiology 407. See Animal Science 407.
412. **Advanced Endocrinology.** Same as Animal Science, Dairy Science, and Physiology 412. See Physiology 412.
413. **Experimental Mammalian Physiology.** Same as Physiology 413. The physiological applications of experimental mammalian surgery. Prerequisite: Physiology 401 and 402, or equivalent; consent of instructor. 1 unit.
461. **Systemic Pharmacology and Toxicology.** An in-depth study of the effects of drugs and toxicants on the various organ systems of the animal body. Prerequisite: Veterinary Biosciences 318 and 320, or equivalent. 3/4 unit.
463. **Radioisotopes in Biological Research: Principles and Practice.** Same as Animal Science 463 and Biophysics 463. Lectures, demonstrations, and laboratory on the fundamentals of radioisotope procedures and applications in biology and medicine. Prerequisite: Quantitative chemistry; one year each of mathematics, physics, and biology, and/or consent of instructor. 1 unit.
465. **Comparative Disposition of Xenobiotics.** Lecture-discussion concerning the fate of foreign chemicals in various species of animals; principles of absorption, distribution, biotransformation, and excretion of drugs and toxicants; and

- pharmacokinetics and factors which modify these processes. Prerequisite: Biochemistry 353 and Veterinary Biosciences 320, or equivalent. 1 unit.
466. **Comparative Environmental Toxicology and Drug Resistance.** The chemistry, mechanisms, actions, and disposition of substances toxic to man and other animals; nature of host-toxicant interactions; and the biological consequences of such interactions, including toxicological mechanisms and their public health significance. Prerequisite: Veterinary Biosciences 465 or consent of instructor. 3/4 unit.
467. **Principles of Drug or Toxicant Evaluation.** Comprehensive discussion of the design, performance, and analysis of clinical trials for evaluation of drugs or toxic materials in domesticated animals. Students may elect to follow a pharmacologic track (3/4 unit), a toxicologic track (3/4 unit), or both (1 unit). Prerequisite: Agronomy 340 and Veterinary Biosciences 318 and 320, or equivalent. 3/4 or 1 unit.
490. **Seminar.** Required of all graduate students whose major is veterinary biosciences. 1/4 unit.
492. **Special Problems.** Basic and applied study including orientation and research on pertinent initial and continuing problems in the student's area of interest. Prerequisite: Consent of instructor. 1/4 to 1 unit.
499. **Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units

VETERINARY CLINICAL MEDICINE

Head of Department: Professor B. K. Gustafsson

Department Office: 244 Small Animal Clinic, 1008 West Hazelwood Dr., Urbana

322. **Veterinary Clinical Pharmacology: The Basis for Rational Therapeutics.** Same as Veterinary Biosciences 322. See Veterinary Biosciences 322.
347. **Veterinary Clinical Oncology.** Advanced clinical techniques used in the diagnosis and treatment of neoplastic diseases of domestic animals. Prerequisite: Fourth-year standing in the veterinary curriculum. 1 hour.
348. **Advanced Veterinary Clinical Pathology.** Same as Veterinary Pathobiology 348. See Veterinary Pathobiology 348.
360. **Medicine, I: General Medicine.** Diagnosis, treatment, and prophylaxis of infectious, noninfectious, and surgical diseases of the small domestic animals; lectures, quizzes, and demonstrations. Required in the veterinary curriculum. Prerequisite: Second-year standing in veterinary curriculum. 5 hours.
361. **General Veterinary Surgery.** Surgical principles including sterile technique, hemostasis, tissue handling, and wound healing with emphasis on clinical application in domestic animals; surgical procedures of the major body systems emphasizing pre-operative, operative, and post-operative patient care. Laboratory covers demonstration and practice of surgical principles. Prerequisite: Third-year standing in veterinary curriculum. 4 hours.
362. **Clinical and Laboratory Practice.** Clinical and laboratory practice in diagnosis, treatment, and prophylaxis of animal diseases; lectures, quizzes, and demonstrations. Prerequisite: Third-year standing in veterinary curriculum. 2 hours.
364. **Medicine, II: General Medicine.** Diagnosis, treatment, and prevention of noninfectious, nutritional, metabolic, toxic, and parasitic diseases of large animals; lecture and discussion. Prerequisite: Third-year standing in veterinary curriculum. 5 hours.
365. **Special Veterinary Surgery.** Lectures and clinical demonstrations on surgical diseases and their diagnosis, operative treatment, and aftercare, together with appropriate laboratory practice. Prerequisite: Third-year standing in veterinary curriculum or consent of instructor. 5 hours.
366. **Clinical and Laboratory Practice.** Clinical and laboratory practice in diagnosis, treatment, and prophylaxis of animal diseases. Prerequisite: Third-year standing in veterinary curriculum. 2 hours.

367. **Radiology and Radiobiology.** Same as Veterinary Biosciences 367. General principles of radiology and radiobiology techniques and application to the diagnosis and therapy of animal diseases; lectures and discussions. Prerequisite: Third-year standing in veterinary curriculum or consent of instructor. 3 hours.
368. **Infectious Diseases and Preventive Medicine.** Diagnosis, treatment, and prevention of infectious diseases of large animals; lectures, discussions, and quizzes. Prerequisite: Third-year standing in veterinary curriculum. 5 hours.
369. **Clinical and Laboratory Practice.** Clerkship in veterinary clinical medicine and surgery. Prerequisite: Fourth-year standing in veterinary medicine professional curriculum, or equivalent. 4 hours.
370. **Seminar.** Faculty presentation of in-depth material concerning clinical aspects of medicine and surgery. Prerequisite: Fourth-year standing in veterinary medical curriculum. 1 hour.
371. **Clinical and Laboratory Practice.** Clinical and laboratory practice in diagnosis, treatment, and prophylaxis of animal diseases. Fourth-year veterinary students enrolled in this course spend two days at the Dixon Springs Agricultural Center at Simpson, Illinois, where they participate in the fall roundup and gain valuable experience in the handling, examination, and treatment of diseases of range cattle; see Timetable for approximate cost. Transportation is furnished. Prerequisite: Fourth-year standing in veterinary medicine. 8 to 18 hours.
372. **Veterinary Jurisprudence and Ethics.** Principles of law and professional ethics of importance to members of the veterinary profession; animal diseases and related regulatory laws and their administration; and federal procedure under animal disease, food, and meat inspection laws. Prerequisite: Fourth-year standing in veterinary medical curriculum. 1 or 2 hours.
373. **Small Animal Urology.** A consideration of the approach to the small animal patient with urinary tract disease, interpretation of laboratory data, and discussion of the pathophysiology and management of common problems in small animal urology. 1 hour.
374. **Clinical and Laboratory Practice, III.** Clerkship in veterinary clinical medicine and surgery. Prerequisite: Fourth-year standing in veterinary medicine professional curriculum, or equivalent. 3 or 4 hours.
375. **Theriogenology.** Examines principles of animal reproduction, fertility, and obstetrics of all species of domestic animals, emphasizing farm animals; lectures, discussion, and laboratory practice in obstetrics, pregnancy diagnosis, and male and female in fertility. Prerequisite: Third-year standing in veterinary curriculum. 4 hours.
376. **Veterinary Anesthesiology and Fluid Therapy.** Principles of veterinary anesthesiology emphasizing clinical application of anesthetic techniques and procedures in domestic animals; clinical pharmacology of preanesthetic, anesthetic, and related drugs, anesthetic and physiologic monitoring equipment, and shock, fluid, and electrolyte therapy with overall emphasis on maintaining homeostasis in anesthetized animals. Prerequisite: Third-year standing in veterinary curriculum. 2 hours.
377. **Disease Prevention and Therapy in Swine Production.** Practical diagnostic, preventive, and treatment procedures in modern veterinary swine practice; relationships between swine production methods and disease conditions; and herd health programs. Lectures, laboratories, and field trips. Prerequisite: Fourth-year standing in veterinary curriculum. 2 hours.
378. **Veterinary Clinical Orientation.** Same as Veterinary Biosciences and Veterinary Pathobiology 378. Lectures and demonstrations illustrating the interrelationships between the basic sciences and their applications in medicine and surgery; includes methods of restraint and handling of several animal species. Prerequisite: First-year standing in the veterinary curriculum. 1 hour.
379. **Advanced Veterinary Ophthalmology.** Anatomic, physiologic, pathologic, and pharmacologic considerations in eye diseases and their treatments; instrumentation and methods of study of ocular structure, physiology, and diseases; and laboratories

- devoted to techniques of examination of the eye and surgical procedures used in treatment of eye diseases. Prerequisite: Fourth-year standing in veterinary curriculum. 1 or 2 hours (1 hour if taking lecture only; 2 hours if taking lecture and lab), or 3/4 unit.
380. **Dairy Herd Health Management.** A study of dairy cattle practice, including economics, enterprise, management, herd and individual cow health, reproduction, and disease control. Prerequisite: Fourth-year standing in veterinary curriculum. 1 hour.
382. **Exotic Pets.** Principles of restraint, diagnosis, and medical and surgical treatment of diseases of small exotic mammals, birds, reptiles, and fish kept as pets. Prerequisite: Third-year standing in veterinary medicine curriculum. 1 hour.
383. **Behavior of Companion Animals.** Fundamentals of animal behavior with emphasis on the normal and abnormal behavior of dogs, cats, and horses. Prerequisite: Fourth-year standing in veterinary curriculum. 1 hour.
384. **Client Relations.** Introduction to client relations, including techniques of effective verbal and nonverbal communication and applications of these techniques for veterinary students. 1 hour.
385. **Advanced Radiographic Interpretation: Large Animal.** In-depth study of radiographic diagnosis applied to large animals, primarily equine; lecture, case study, and discussion centering on anatomic areas, e.g., foot, fetlock, metacarpus/metatarsus, carpus, tarsus, upper limb joints, and head and neck. Prerequisite: Veterinary Clinical Medicine 367 or equivalent. 2 hours.
386. **Advanced Radiographic Interpretation--Small Animal.** An exercise in systematic interpretation of small animal radiographs. Prerequisite: Veterinary Clinical Medicine 371 and consent of instructor. 2 hours.
387. **Advanced Veterinary Anesthesiology.** Lecture material includes anesthetic effects on cardiopulmonary physiology, interrelationships between anesthesia and various types of drug therapy, and balanced anesthetic techniques; laboratory includes new and advanced monitoring techniques, intermittent positive pressure ventilation, and specific anesthetic procedures. Prerequisite: Senior standing in veterinary curriculum or consent of instructor. 1 hour.
388. **Advanced Soft Tissue Surgery.** Advanced techniques in soft tissue surgery in small animals. Prerequisite: Veterinary Clinical Medicine 361 and 365. 1 hour.
389. **Small Animal Diagnostic Instrumentation.** Training in the use of special medical and surgical diagnostic techniques, including endoscopy, ultrasound, and an introduction to electrodiagnostics. Prerequisite: Fourth-year standing in veterinary curriculum. 1 hour.
390. **Equine Reproduction.** Instruction in equine reproductive physiology, infectious and noninfectious infertility problems, obstetrical procedures, and preventive medicine practices. Prerequisite: Fourth-year standing in veterinary curriculum. 1 hour.
391. **Advanced Orthopedics.** Lectures and discussions on advanced orthopedics problems. Prerequisite: Fourth-year standing in the veterinary curriculum. 1 hour.
392. **Special Problems.** Individual research on a special problem chosen in consultation with the instructor and department head. Prerequisite: Registration in veterinary curriculum with grade point average of 4.0 or above, or consent of instructor. 1 to 3 hours, or 1/4 to 3/4 unit. May be repeated to a maximum of 6 hours or 1 unit.
393. **Advanced Clinical Neurology.** Covers all aspects of small animal clinical neurology; an extension of the basic neurology taught in the junior medicine lectures. Prerequisite: Fourth-year standing in veterinary medicine or consent of instructor. 1 hour.
394. **Advanced Bovine Theriogenology.** Advanced instruction in pregnancy diagnosis, postparturient palpations, breeding soundness evaluations, artificial insemination techniques, and special obstetrical procedures. Prerequisite: Veterinary Clinical Medicine 363. 1 hour.
395. **Beef Cattle Economics, Management, and Herd Health.** A study of management systems and the economic factors that influence the cattle industry; health programs

for beef cattle emphasizing the herd approach and the veterinarian's role in the beef cattle industry. Prerequisite: Fourth-year standing in veterinary curriculum. 1 hour.

396. **Advanced Small Animal Surgery.** Lecture and laboratories in advanced small animal surgery. Prerequisite: Fourth-year standing in veterinary curriculum or consent of instructor. 1 hour.
397. **Advanced Equine Lameness.** An elective in the diagnosis and treatment of equine lameness. Prerequisite: Fourth-year standing in the veterinary curriculum. 1 hour.
398. **Selected Economic Topics for Animal Health Professionals.** Surveys some of the current topics directly affecting the financial and business aspects of conveying veterinary care to the animal-owning public; examines current developments in the animal health field. Prerequisite: A basic course in economics and/or accounting is strongly recommended. 2 hours.
490. **Seminar.** Required of all graduate students whose major is veterinary clinical medicine. 1/4 unit.
492. **Special Problems.** Basic and applied study including orientation and research on pertinent initial and continuing problems in the student's area of interest. Prerequisite: Consent of instructor. 1/4 to 1 unit.
499. **Thesis Research.** 0 to 4 units

VETERINARY MEDICAL SCIENCE

Dean of College: Professor R. E. Dierks

Department Office: 141 Veterinary Medicine Building, Urbana

Effective January 1, 1980, the graduate courses in veterinary medical science have been realigned with one of the three departments in the College of Veterinary Medicine. The following courses have been retained to allow existing VMS students to complete their degree requirements in veterinary medical science.

490. **Seminar.** Required of all graduate students whose major is veterinary medical science. 1/4 unit.
499. **Thesis Research.** 0 to 4 units

VETERINARY PATHOBIOLOGY

Acting Head of Department: Professor J. A. Shaddock

Department Office: 57 Veterinary Medicine Building, 1101 West Peabody, Urbana

326. **Parasitologic Techniques and Systematics.** Survey of taxonomy of animal parasites; structures used for taxonomy are studies after collection, preservation, and preparation of parasite specimens. Prerequisite: Veterinary Pathobiology 333 and 336, or equivalent. 3 hours or 3/4 unit.
330. **Veterinary Medical History, Ethics, and Orientation.** Introduction to the history, recent developments, scope, and trends of veterinary medical education, practice, research, public health, and other areas; functions, obligations, and organization of the profession. Prerequisite: First-year standing in veterinary curriculum. 1 hour.
331. **Veterinary Bacteriology and Mycology.** Study of the properties of bacteria and fungi responsible for diseases of domestic and wild animals; emphasizes epidemiology, pathogenesis, and morphological and cultural characteristics of bacteria and fungi, and diagnosis. Prerequisite: First-year standing in veterinary curriculum or consent of instructor. 4 hours.
332. **Veterinary Microbiology and Immunology.** Lectures, discussions, and laboratories dealing with mechanisms of infection and resistance; the properties,

- pathogenesis, and control of viral infections of domestic and wild animals. Prerequisite: Veterinary Pathobiology 331 or consent of instructor. 4 hours or 1 unit.
333. **Protozoan and Arthropod Parasites.** Protozoan and arthropod parasites affecting domestic animals and man; lectures, discussions, and laboratory. Prerequisite: Second-year standing in veterinary curriculum or consent of instructor. 3 hours or 3/4 unit.
334. **General Pathology.** The basic principles of pathological processes, including tissue injury and repair, circulatory and metabolic disturbances, and inflammation and neoplasms; lectures, quizzes, demonstrations, and laboratory. Prerequisite: Second-year standing in veterinary curriculum or consent of instructor. 5 hours or 1 unit.
335. **Special Pathology.** Disease processes affecting organs and anatomic systems and those occurring in specific diseases. Prerequisite: Second-year standing in veterinary curriculum or consent of instructor. 5 hours or 1 unit.
336. **Helminth Parasites.** Helminth parasites affecting domestic animals and man; lectures, discussions, and laboratory. Prerequisite: Second-year standing in veterinary curriculum or consent of instructor. 3 hours or 3/4 unit.
337. **Advanced Veterinary Virology.** Advanced study of virology as related to veterinary medicine; discussion and interpretation of virology literature and its possible applications to veterinary practice. Prerequisite: Veterinary Pathobiology 332. 1 hour.
338. **Veterinary Clinical Pathology.** Discussion of the function and interpretation of hematological, chemical, and certain other procedures, including exfoliative cytology, as aids in the diagnosis of animal diseases; emphasizes the correlation of laboratory findings with fundamental changes and clinical manifestations of disease. Prerequisite: Second-year standing in veterinary curriculum. 4 hours.
339. **Basic Biomedical Photography.** Uses photography as a tool for scientific communication emphasizing production and design for research and instructional purposes; encourages students to explore in depth those areas that are of specific interest (e.g., clinical photography, photomicrography, special techniques in lighting, or areas such as multimedia productions or self-instructional techniques). Prerequisite: Sophomore standing in the veterinary curriculum or consent of instructor. 1 or 2 hours.
341. **Food Hygiene and Public Health.** Introduction to public health; diseases of animals transmissible to man; and procedures and techniques used in inspection of food of animal origin. Prerequisite: Second-year standing in veterinary curriculum or consent of instructor. 3 or 4 hours.
343. **Diseases of Poultry.** The causes, symptoms, lesions, prevention, and treatment of noninfectious and infectious diseases of domestic birds; lectures, quizzes, and PLATO demonstrations. Prerequisite: Third or fourth year standing in veterinary curriculum or consent of instructor. 2 hours.
344. **Clinical Immunology.** The impact of immunologic mechanisms in clinical medicine; autoimmunity, tolerance, immune complex disease, and immunoprophylaxis; lectures and demonstrations. Prerequisite: Veterinary Pathobiology 332 or equivalent. 2 hours or 1/2 unit.
345. **The Use of Laboratory Animals: Principles and Techniques.** Lectures and discussions dealing with laboratory animals as complex biological instruments and variables affecting their definition; laboratories deal with techniques used in laboratory animal experimentation. Prerequisite: Consent of instructor. 2 hours or 1/2 unit.
346. **Management and Diseases of Laboratory Animals.** Principles of colony management and disease control of the common laboratory animals; emphasizes the production and maintenance of quality animals for research; and includes a field trip to AAALAC-accredited facilities. Prerequisite: Two courses in biology and consent of instructor. 2 hours or 1/2 unit.

348. **Advanced Veterinary Clinical Pathology.** Same as Veterinary Clinical Medicine 348. Advanced lectures, discussions, and laboratory work in hematology, exfoliative cytology, and clinical chemistry. Prerequisite: Veterinary Pathobiology 338. 2 hours.
349. **Applied Methodologies of Epidemiologic Research.** Seminar for senior veterinary students interested in exploring the methods used in epidemiologic research. Each participant leads a seminar discussion of a selected topic; each discussion period focuses on adequacy of experimental design and analysis, design of follow-up studies, and recent work in the field. Prerequisite: Veterinary Pathobiology 341. 1 hour.
350. **Epidemiology.** Principles and uses of epidemiology and biostatistics in the practice of veterinary medicine. Prerequisite: Second-year standing in veterinary curriculum or consent of instructor. 1 hour.
374. **General Epidemiology.** Same as Environmental Studies, Health Education, and Medical Sciences 374. See Health Education 374.
378. **Veterinary Clinical Orientation.** Same as Veterinary Biosciences and Veterinary Clinical Medicine 378. See Veterinary Clinical Medicine 378.
392. **Special Problems.** Individual research on a special problem chosen in consultation with the instructor and department head. Prerequisite: Registration in veterinary curriculum with grade- point average of 4.0 or above, or consent of instructor. 1 to 3 hours, or 1/4 to 3/4 unit. May be repeated to a maximum of 6 hours or 1 unit.
415. **Mechanisms of Microbial Infections.** Newer concepts of host- microorganism relations; emphasis on the dynamics and pathogenic mechanisms of microorganisms, immune responses and defense factors of the host, and pathogenesis of specific infections. Lectures, discussions, laboratory, and special problems. Prerequisite: Microbiology 326 or Veterinary Pathobiology 332, or equivalent; consent of instructor. 3/4 or 1 unit.
416. **Epizootiology.** Principles and problems of epizootiology; special consideration of the zoonoses; ecology of the host and parasite as related to resistance, adaptation, perpetuation, and distribution; the principles and factors in interference, carrier and latent states, and reservoirs and control. Prerequisite: Veterinary Pathobiology 331 or 332, or equivalent, or consent of instructor. 1 unit.
417. **Medical Mycology.** Study of the fungi that cause infections in man and animals; taxonomy, methodology, epidemiology, pathology, and diagnosis. Prerequisite: Microbiology 326 or Veterinary Pathobiology 332, or equivalent. 1 unit.
418. **Concepts and Topics in Immunology.** Same as Genetics and Development 418. Newer concepts and theories in the field of immunology, including theories of antibody formation and immunological tolerance, regulation of the immune response, biosynthesis and structure of antibodies, and evolutionary aspects of the immune response. Lectures and discussion. Prerequisite: Consent of instructor; Microbiology 327 and Biology 307 recommended. 1/2 unit.
419. **Animal Virology.** Same as Microbiology 419. A discussion- laboratory with major emphasis on host-parasite relationships, natural history, and epidemiology, supplemented with appropriate laboratory techniques as they pertain to the major groups of animal viruses. Prerequisite: Microbiology 327 and 328, or Veterinary Pathobiology 331 and 332; Biochemistry 350 or 354; consent of instructor. 3/4 unit.
425. **Experimental Parasitology.** Same as Genetics and Development 425. A broadly based consideration of the relation of parasites to their hosts and to their environments, and of the factors which influence these relationships. Prerequisite: A laboratory course in parasitology or protozoology; organic chemistry; Biochemistry 350 and statistics recommended. 1 unit.
427. **Parasitology Seminar.** Discussion of selected historic and current literature related to parasitology. Prerequisite: Veterinary Pathobiology 333 and 336, or Genetics and Development 321, or the equivalent, or concurrent enrollment in any one of these courses. 1/4 unit. May be repeated to a maximum of 1/2 unit.
437. **Immunoparasitology.** Discusses the immune response to protozoan, helminth, and arthropod parasites of veterinary and zoonotic importance and its relationship to parasite survival, protective immunity and diagnosis. Prerequisite: Veterinary

- Pathobiology 332 or Genetics and Development 307, or equivalent; and Veterinary Pathobiology 333. 1 unit.
- 445. Advanced Macroscopic Pathology.** Concepts and interpretations of gross pathologic changes, and the integration of host-parasite reactions. Prerequisite: Veterinary Pathobiology 334 and 335, or equivalent; consent of instructor. 1/2 or 1 unit.
- 450. Advanced Veterinary Pathology.** Advanced study of gross and microscopic pathology of diseases of domestic animals. Prerequisite: Veterinary Pathobiology 335 or equivalent. 1 unit.
- 455. Comparative Oncology.** A comparative study of the nature of mammalian and avian neoplasms based on general and special methods of tumor identification, classification, and experimentation; lectures, demonstrations, and laboratory. Required course for students majoring in pathology. Prerequisite: Veterinary Pathobiology 445 and 459, or equivalent. 1 unit.
- 457. Ultrastructural Pathology.** Same as Biology 457. Ultrastructural basis of pathologic processes occurring in animal tissues and cells. Lectures, discussions, and reports. Prerequisite: Consent of instructor. 3/4 or 1 unit.
- 459. Advanced Correlative Pathology.** Discussion and interpretation of disease processes of domestic animals; emphasis on the correlation of gross, microscopic, and clinicopathologic findings with alterations of function. Prerequisite: Veterinary Pathobiology 335, 445, or 450, or equivalent; consent of instructor. 0 to 1 1/2 units.
- 490. Seminar.** Required of all graduate students whose major is veterinary pathobiology. 1/4 unit.
- 491. The Experimental Method in Veterinary Research.** Planning of experiments, use of controls, interpretation of results, sources of error, and writing the research report. 1/2 unit.
- 492. Special Problems.** Basic and applied study including orientation and research on pertinent initial and continuing problems in the student's area of interest. Prerequisite: Consent of instructor. 1/4 to 1 unit.
- 499. Thesis Research.** 0 to 4 units

VOCATIONAL AND TECHNICAL EDUCATION

Chairperson of Department: Professor H. C. Kazanas

Department Office: 347 Education Building, 1310 South Sixth, Champaign

- 101. Nature of the Teaching Profession.** Introduction to educational problems; a general study of the nature of teaching; its opportunities and responsibilities. Through individual work, students are helped to evaluate their potentialities for teaching. 2 hours.
- 152. Pre-educational Internship.** Early field experiences in teacher education, including observation and laboratory experiences in community colleges, adult vocational programs, business and industry, health service settings, or governmental agencies; designed to provide opportunities for career exploration, professional orientation, interrelating theory and practice, and understanding the place of the student in the educational process. Prerequisite: Consent of instructor. 0 to 3 hours.
- 181. Introductory Woodwork.** Beginning course in hand woodwork, with emphasis on both manipulative skills and related technical material. This course is offered for majors in industrial education and students in the occupational therapy curriculum. May be taken by others as an elective on a space available basis. 4 hours.
- 182. Advanced Course in Woodwork.** Advanced course in design and construction of woodwork projects with related technical information. Prerequisite: Vocational and Technical Education 181. 4 hours.
- 189. Supervised Occupational Experience.** Provides students preparing to teach in the vocational and technical fields the occupational experience necessary or appropriate

to complete the requirements in these curricula. Students who are employed and concurrently enrolled in this course complete assignments covering the related technical information of their chosen fields and undergo regularly scheduled written, oral, and performance examinations. Application for a job assignment must be made three months prior to the semester in which placement is desired. Prerequisite: Sophomore standing. 2 or 3 hours. May be repeated to a maximum of 17 hours.

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
240. **Principles of Vocational and Technical Education.** Provides each specialized educational worker with a common orientation as to the major responsibilities of the public school as a unit and to the educational worker's own specialized responsibilities and problems within the framework of the total educational enterprise. Prerequisite: Vocational and Technical Education 101; Psychology 100. 2 to 4 hours.
249. **Independent Study.** Permits study of problems not considered in other courses; designed for students who excel in self-direction and intellectual curiosity. Prerequisite: Upperclassman; upper five percent of class in grade-point average; demonstrated writing competence, research potential, scholarly attitude, and interest as attested to by instructors; consent of adviser and staff member who supervises the work. 2 hours.
252. **Educational Internship.** A practicum in a postsecondary educational setting to prepare students for educational roles where public school certification is not necessary or appropriate. Prerequisite: Vocational and Technical Education 152 and satisfactory progress in the technical education specialties curriculum. 5 to 8 hours.
270. **Technique and Curriculum Development for Teaching Secretarial and Office Practice Subjects.** Review of results of current research and experimentation in the teaching of typewriting, shorthand, and other office practice subjects; review of basic education principles relative to skill development; and introduction to the use of innovations and technology, and their implications for office education. Proficiency level in typewriting and shorthand must be validated through examination administered by business education faculty prior to enrollment in the course. 3 hours.
271. **Technique and Curriculum Development for Teaching Data Processing and Office Machines.** Introduction of techniques for teaching the operation of a variety of office machines used for processing data; introduction of current methods of teaching the use of automated data-processing equipment and requirements for employment. Proficiency level in the operation and theory of operation of office machines used for processing data must be validated through examination administered by business education faculty prior to enrollment in the course. 3 hours.
275. **Summer Experience in Agricultural Education.** Supervised experience in the work of a teacher of agricultural occupations during a two- or three-week period in the summer; planning summer work, teaching adult classes, supervising farm practice or on-the-job training of students, advising school-sponsored youth organizations, counseling students, studying a community, becoming acquainted with facilities and equipment used in an agricultural occupations program, and becoming familiar with the situations in which the student will later do student teaching during a school year. Course work is completed during the summer with official registration in the fall semester. Prerequisite: Educational Policy Studies 201. 2 or 3 hours.
276. **Student Teaching in Agricultural Occupations.** Supervised experience in the work of a teacher of agricultural occupations during an eight-week period; planning programs, teaching high school and adult students, managing facilities and equipment, supervising students on the job, advising youth organizations, counseling students, and keeping records and making reports. Prerequisite: Educational Policy Studies 201 and Vocational and Technical Education 240, or consent of instructor; registration in Vocational and Technical Education 277. 8 hours.
277. **Programs and Procedures in Agricultural Education.** Preparation for a successful experience in student teaching and for beginning work as a teacher of agricultural occupations; teaching high school and adult classes, maintaining and using facilities and equipment, supervising occupational experience programs, advising youth

- organizations, counseling students, and keeping records and making reports. Prerequisite: Educational Policy Studies 201 and Vocational and Technical Education 240, or consent of instructor; registration in Vocational and Technical Education 276. 5 hours.
278. **Vocational Home Economics Education for Youth and Adults.** Preparation for work as a teacher in vocational home economics programs for youth and adults; study of procedures for planning, organizing, executing, and evaluating home economics occupational programs. Prerequisite: Senior standing and consent of instructor. 3 hours.
280. **General Drafting for Teachers.** An integrating course to prepare industrial education students to teach drafting; deals primarily with the problems of organizing and teaching drafting courses. 3 hours.
291. **Thesis.** Prerequisite: Senior standing. 2 hours.
292. **Thesis.** Prerequisite: Senior standing. 2 hours.
309. **Vocational Education for Special Needs Learners.** Same as Special Education 309. Examines contemporary legislation, program models, assessment, and instructional practices pertaining to special needs learners in vocational, technical and practical arts education programs at the secondary and post-secondary levels. Prerequisite: Student teaching or consent of instructor. 4 hours or 1 unit.
345. **Vocational Training for Mentally Retarded Adolescents and Adults.** Same as Special Education 345. See Special Education 345.
349. **Special Study and Investigation in Vocational and Technical Education.** Offers opportunity for an individual to study, on or off campus, selected problems, trends, and new developments or to conduct specialized technological investigations for the improvement of instructional programs in areas related to vocational and technical education. Prerequisite: Consent of instructor; demonstrated ability to pursue special study or investigation proposed. 2 to 4 hours, or 1/2 to 1 unit.
350. **Education for Rural Development in Low Income Countries.** Same as Agriculture 350. Study of educational institutions needed to further rural development in developing nations; emphasizes educational programs that enable rural families to improve their quality of life. Prerequisite: Senior standing. 3 or 4 hours, or 3/4 or 1 unit.
356. **Study of Careers in Health Occupations.** Analysis of health occupations careers through comparison of models for preparing various health practitioners; generalization of effects of health care needs across the allied health fields; and determination of cause-effect relationships impinging on health occupations role performance. Prerequisite: Vocational and Technical Education 381 or consent of instructor. 2 or 4 hours, or 1/2 or 1 unit.
357. **The Relationship of Health Occupations Education and Health Care Delivery Systems.** Assessment of the present status, trends, issues, and implications of health care delivery systems as related to health occupations education; identification of leadership skills for initiation, implementation, and evaluation of health occupations programs; and generation of criteria for curriculum modification in response to impinging social forces, such as legislation and manpower needs. Prerequisite: Vocational and Technical Education 356 and 383 or 388, or equivalent. 2 or 4 hours, or 1/2 or 1 unit.
359. **Professional Skill Development Workshop in Vocational and Technical Education.** Designed to teach practitioner-oriented skills in specialized areas of vocational and technical education; students or faculty members may make requests for initiation of sections of this course. 2 or 4 hours, or 1/2 or 1 unit. May be repeated to a maximum of 8 hours or 2 units.
370. **Agricultural Education for First-Year Teachers.** Specific help with the problems of beginning teachers; campus meeting in August; other meetings in centers in the state convenient to first-year teachers; and visits by instructors to schools in which first-year teachers are employed. Prerequisite: Vocational and Technical Education 276 and 277. 3 hours, or 3/4 to 1 unit.

381. **Foundations of Career, Occupational, and Practical Arts Education.** A study of basic concepts and practices of career, occupational, and practical arts education; explores the development of the curricular areas concerned, including types of programs, their place and role in various types of educational settings, students served, and issues and trends in program change. 2 or 4 hours, or 1/2 or 1 unit.
382. **Cooperative Vocational and Technical Education Programs.** Provides the specific professional background required of teachers, coordinators, and administrators who organize and conduct public school programs utilizing community resources and experiences; includes the background, philosophy, organization, and administration of cooperative education. 2 or 4 hours, or 1/2 or 1 unit.
383. **Planning and Organizing Content for Career, Occupational, and Practical Arts Education.** Emphasizes selection, organization, and preparation of content for instructional programs in career, occupational, and practical arts education; students perform task analyses, prepare instructional objectives, arrange content in appropriate sequence, and determine allocation of resources. 2 or 4 hours, or 1/2 or 1 unit.
384. **The General Shop Program.** A laboratory and theory course in the organization and administration of the industrial arts general shop program. Prerequisite: Sixteen hours of undergraduate credit in appropriate vocational and technical education courses. 4 hours or 1 unit.
385. **Problems in Concurrent Work-Education.** While employed in approved cooperating business firms, students observe the relationships between their activities and the specialized educational programs in the high school and community college; in class sessions, emphasis on job analysis, current trends, wage and benefit structure, personnel practices, labor relations, and their implications for teaching. Prerequisite: Completion of prescribed courses in vocational and technical education for teaching in their area of specialization; consent of instructor. 4 hours or 1 unit.
387. **Training Programs in Industry.** Study of the organization, instruction, supervision, and evaluation of training programs conducted within industry and their relationships to other educational agencies. 4 hours or 1 unit.
388. **Special Techniques of Teaching Career, Occupational, and Practical Arts Education.** A study of teaching techniques appropriate to career, occupational, and practical arts education; focuses on communication methods and instructional strategies; students conduct investigations, develop materials, and make applications to their areas of concern. 2 or 4 hours, or 1/2 or 1 unit.
399. **Issues and Developments in Vocational and Technical Education.** A special course for experimentation or for seminar on topics not treated by regularly scheduled courses; requests for initiation of this course may be made by students or faculty members. 2 or 4 hours, or 1/2 or 1 unit. May be repeated to a maximum of 8 hours or 2 units.
442. **The Community College.** Same as Administration, Higher, and Continuing Education 442. See Administration, Higher and Continuing Education 442.
445. **Investment in Human Resources.** Same as Labor and Industrial Relations 445. See Labor and Industrial Relations 445.
448. **Continuing Education Program Development.** Same as Administration, Higher, and Continuing Education 448 and Secondary Education 448. See Administration, Higher, and Continuing Education 448.
449. **Independent Study.** Offers opportunity and challenge of self-directive, independent study, that is, develops the individual's ability as an independent student and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department chairman prior to enrollment. 1/2 or 1 unit. No more than 2 units may be offered toward an advanced degree except by consent of the dean of the College of Education.
450. **Evaluation in Vocational, Technical, and Practical Arts Education.** Theory and techniques of vocational education evaluation in cognitive, affective, and psychomotor domains at different educational levels; development and analysis of activities and

instruments for student and program evaluation, follow-up studies, and interpretation of results for self-evaluation and for administrative decision making. Prerequisite: Educational Psychology 392 and Vocational and Technical Education 471, or consent of instructor. 1 unit.

- 451. Directing Personnel Development in Vocational, Technical, and Practical Arts Education.** Principles and techniques for development of personnel in programs of vocational, technical, and practical arts education; emphasis on personnel development and instructional supervision of paraprofessionals, employers, and foremen of vocational and technical education students. Prerequisite: One unit in vocational and technical education or consent of instructor. 1 unit.
- 453. Disciplined Inquiry in Vocational Education.** Provides an overview of disciplined inquiry in vocational education including an historical perspective, overview of the research process, and the utilization and communication of research. Prerequisite: Educational Psychology 390, or equivalent course or experience. 1 unit.
- 456. Problems and Trends in Specialized Fields of Vocational and Technical Education.** Introduction to significant problems, points of view, and trends in the field concerned; explores significant research relating to organization, content, and techniques in the field in question. Students are encouraged to make special studies in approved areas. 1 unit.
- 471. Policy and Program Development in Vocational, Technical, and Practical Arts Education.** Local, state, and national policies for vocational and technical education; organizing for policy making and program development; and developing desirable policies and programs. 1 unit.
- 472. Course Planning and Teaching Procedures in Agricultural Occupations Programs.** Gathering data essential in course planning, constructing course plans, and developing resource units, teaching procedures, and instructional aids. Prerequisite: Vocational and Technical Education 276 and 277, or consent of instructor. 3/4 to 1 unit.
- 473. Vocational Education in Agriculture for Adults.** The case for adult education, needs of young and adult farmers for education, development and present status of adult education in agriculture, objectives, evaluation, using advisory committees, organizing adult classes, enrolling students, course planning, teaching procedures and aids, supervised practice, group activities, and facilities. Prerequisite: Vocational and Technical Education 276 and 277, or consent of instructor. 3/4 to 1 unit.
- 474. Supervised Experience in Agricultural Occupations Programs.** Supervised agricultural experience programs as an educational strategy; importance and meaning of supervised agriculture experiences; planning, conducting, supervising, and evaluating agriculture experience programs; relation of supervised agriculture experience programs to establishment and advancement in an occupation; keeping and using records; and relating class instruction to supervised agriculture experience programs. Prerequisite: Vocational and Technical Education 276 and 277, or consent of instructor. 3/4 to 1 unit.
- 475. Organizing and Teaching Agricultural Mechanics.** Agriculture mechanics as a phase of vocational education in agriculture: purposes, course planning for high school students, young farmers, and adults; methods of teaching and evaluating on-farm or on-job instruction; planning agriculture-mechanics shops and facilities; and providing and teaching safety in agriculture mechanics. Prerequisite: Vocational and Technical Education 276 and 277, or consent of instructor. 3/4 to 1 unit.
- 476. Guidance in Vocational, Technical, and Practical Arts Education.** The guidance function of a vocational or technical teacher; identifying and selecting students for vocational and technical programs; determining manpower and job requirements; providing occupational information; placing graduates; counseling parents, students, foremen, advisory committee members, union members, and employers; and conducting follow-up studies. 1 unit.
- 481. History and Basic Concepts of Vocational and Technical Education.** The historical development of modern vocational education; the educational theories

underlying its development; and the educational concepts upon which present programs and procedures are based. 1 unit.

482. **Research Studies in Vocational and Technical Education.** Study and evaluation of examples of research in this field; consideration of the research needed to solve present problems. Each student proposes and completes a brief research project, or plans in detail a major research project to be completed later. 1 unit.
487. **Seminar in Vocational, Technical, and Practical Arts Education.** Overview and interpretation of social, economic, and technological trends which have relevance to the problem of developing new programs in the vocational, technical, and practical arts areas; analysis and evaluation of innovations in the field; and current issues and problems. Prerequisite: Graduate standing in vocational and technical education. 1 unit.
488. **Foundations of Curriculum Development for Occupational and Practical Arts Education.** Synthesizes selected sociological, psychological, and epistemological foundations for curriculum development in occupational and practical arts education; application of theories from fundamental disciplines to practice in existing and emerging curricula involving perceptual and psychomotor learning. 1/2 or 1 unit.
489. **Administration of Vocational and Technical Education.** Problems and approved practices in the administration and supervision of programs of vocational, technical, and practical arts education in secondary schools, junior colleges, and technical institutes. Prerequisite: Consent of instructor. 1 unit.
490. **Seminar for Advanced Students of Education.** Seminar in vocational and technical education open only to persons who have been admitted for doctoral study in vocational and technical education; sections are usually offered in the following areas: (a) industrial education, (b) agricultural education, (c) home economics education, (d) business education, (e) health occupations, and (f) general vocational and technical education. 0 to 2 units.
491. **Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems; students present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze critically all presentations. Limited to students who have been admitted for doctoral study. 1 to 2 units.

RUBRIC ABBREVIATIONS

Following is a list of official rubric abbreviations for courses currently approved for offering on the Urbana-Champaign campus of the University of Illinois.

A A E	Aeronautical and Astro- nautical Engineering	CHEM	Chemistry
ACCY	Accountancy	CHIN	Chinese
ADV	Advertising	CLCIV	Classical Civilization
AFAS	Air Force Aerospace Studies	C LIT	Comparative Literature
AFRO	Afro-American Studies	COMM	Communications
AFRST	African Studies	COP	Coptic
AGCOM	Agricultural Communications	C S	Computer Science
AG E	Agricultural Engineering	CZECH	Czech
AG EC	Agricultural Economics	DANCE	Dance
AG M	Agricultural Mechanization	D S	Dairy Science
AGR	Agriculture	ECON	Economics
AGRON	Agronomy	ED PR	Educational Practice
AHCE	Administration, Higher, and Continuing Education	EDPSY	Educational Psychology
ANAT	Anatomical Sciences	EDUC	Education
AN S	Animal Science	E E	Electrical Engineering
ANTH	Anthropology	E E E	Ecology, Ethology, and Evolution
ARAB	Arabic	EL ED	Elementary and Early Childhood Education
ARCH	Architecture	ENG	Engineering
ART&D	Introduction to Art and Design	ENG H	Engineering Honors
ARTCI	Cinematography	ENGL	English
ARTCR	Crafts	ENTOM	Entomology
ARTED	Art Education	ENVST	Environmental Studies
ARTGD	Graphic Design	E P S	Educational Policy Studies
ARTGP	General Professional Courses in Art and Design	E S L	English as a Second Language
ARTHI	History of Art	F A A	Fine and Applied Arts
ARTID	Industrial Design	FACE	Family and Consumer Economics
ARTPA	Painting	FIN	Finance
ARTPH	Photography	F N	Foods and Nutrition
ARTPR	Printing	FOR	Forestry
ARTSC	Sculpture	FR	French
AS ST	Asian Studies	F S	Food Science
ASTR	Astronomy	G & D	Genetics and Development
ATMOS	Atmospheric Sciences	GE	General Engineering
AVI	Aviation	GEOG	Geography
B ADM	Business Administration	GEOL	Geology
BANDS	Bands	GER	German
B&T W	Business and Technical Writing	GMC	Germanic
BIOCH	Biochemistry	GRK	Greek
BIOEN	Bioengineering	HDFF	Human Development and Family Ecology
BIOL	Biology	H ED	Health Education
BIOPH	Biophysics	HEBR	Hebrew
BOT	Botany	HINDI	Hindi
BUS	Business	HIST	History
CATAL	Catalan	HORT	Horticulture
C E	Civil Engineering	HRFS	Human Resources and Family Studies
CER E	Ceramic Engineering	HUMAN	Humanities
CH E	Chemical Engineering	I D	Interior Design

I E	Industrial Engineering	POL	Polish
ITAL	Italian	POL S	Political Science
JAPAN	Japanese	PORT	Portuguese
JOURN	Journalism	PSYCH	Psychology
KOREA	Korean	RELST	Religious Studies
L A	Landscape Architecture	RHET	Rhetoric and Composition
L A S	Liberal Arts and Sciences	RMLNG	Romance Linguistics
LA ST	Latin American and Caribbean Studies	R SOC	Rural Sociology
LAT	Latin	RUMAN	Rumanian
LAW	Law	RUSS	Russian
LEIST	Leisure Studies	R TV	Radio and Television
L I S	Library and Information Science	SANSK	Sanskrit
LING	Linguistics	SCAN	Scandinavian
L I R	Labor and Industrial Relations	S CR	Serbo-Croatian
MATH	Mathematics	S ED	Safety Education
MCBIO	Microbiology	SE ED	Secondary Education
M E	Mechanical Engineering	SLAV	Slavic
MED S	Medical Sciences	SOC	Sociology
MET E	Metallurgical Engineering	SOC S	Social Science
M GRK	Modern Greek	SOC W	Social Work
MIL S	Military Science	SOILS	Soils
MIN E	Mining Engineering	SP ED	Special Education
MUSIC	Music	SPAN	Spanish
NA	Medical-Surgical Nursing	SPCOM	Speech Communication
NE	Public Health Nursing	SPSHS	Speech and Hearing Science
NS	General Nursing	SWHLI	Swahili
N S	Naval Science	T A M	Theoretical and Applied Mechanics
NUC E	Nuclear Engineering	T C	Textiles and Clothing
NUTRS	Nutritional Sciences	THEAT	Theatre
P E	Physical Education	UKR	Ukrainian
PERS	Persian	U P	Urban and Regional Planning
PHIL	Philosophy	V B	Veterinary Biosciences
PHYCS	Physics	V C M	Veterinary Clinical Medicine
PHYSL	Physiology	V M S	Veterinary Medical Science
PL PA	Plant Pathology	V P	Veterinary Pathobiology
		VOTEC	Vocational and Technical Education

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